

Engineer Research and Development Center

Field Survey of Contaminant Concentrations in Existing Wetlands in the San Francisco Bay Area

C. R. Lee, D. L. Brandon, J. W. Simmers, H. E. Tatem R. A. Price, and S. P. Miner

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SUMMARY

There is an increased public awareness of the importance of wetlands and a heightened interest in restoration and creation of wetlands using dredged material. Dredged material is being tested for potential use in wetland creation and restoration projects. In order to evaluate the acceptability of wetland creation and restoration with dredged material, establishment of some form of reference wetland baseline from which to make informed evaluations is often necessary. Test data must be interpreted in relationship to realistic circumstances. The reference baseline is usually chosen from the particular location where wetlands will be created or restored.

The objective of this study was to determine the concentrations of contaminants in sediments, plants and animals in existing wetlands near proposed wetland creation sites and to establish a reference wetland baseline for the San Francisco Bay area. The data collected would become an initial wetland baseline that can be used to interpret and put perspective on results of wetland testing of dredged material from the San Francisco Bay area.

Thirteen naturally occurring wetlands were sampled in marine, estuarine and freshwater locations along San Francisco and Suisun Bays and in the Sacramento River Basin. Wetland sediment, plant and animal samples were collected and transported to the U.S. Army Engineer Waterways Experiment Station (WES) for processing and analysis. Samples were analyzed for metals, butyltins, petroleum aromatic hydrocarbons, pesticides and polychlorinated biphenyls.

The naturally-occurring wetlands in the San Francisco Bay area and the adjacent estuarine and freshwater areas contained relatively low levels of most metal, PCBs, PAHs, butyltin, and pesticide contaminants in soil/sediment, plants, and animals. Metals such as lead, chromium and arsenic appeared to have elevated concentrations in some plants and animals. There was a very depauperate faunal component in all the naturally-occurring wetlands surveyed, that may be the result of a more subtle impact. This survey was conducted toward the end of a five year drought in the region. This climatic condition no doubt influenced the existing fauna available for sampling.

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PREFACE

This report presents the results of a field survey of existing wetlands in the San Francisco Bay area performed for Messrs. Brian Walls, Duke Roberts, Mark Dettle and Tom Kendall, project managers at the San Francisco District of the US Army Corps of Engineers. The study was conducted by the US Army Engineer Waterways Experiment Station (WES) during the period July 1990 through September 1991.

Work was performed by Dr. Charles R. Lee, Soil Scientist; Dr. Henry E. Tatem, Zoologist; Dr. John W. Simmers, Research Biologist; Mr. Richard A. Price, Research Agronomist; Mr. Dennis L. Brandon, Statistician; Contaminant Mobility and Regulatory Criteria Group (CMRCG), Environmental Processes and Effects Division (EPED), Environmental Laboratory (EL); and Mr. Scott P. Miner, Ecologist, San Francisco District, U.S. Army Corps of Engineers (SPN).

Animal bioassessment acknowledges Mr. Lawrence Bird (ASCI Corporation), and Ms. Heather Holifield, Mr. Michael Pendarvis, and Mr. Johnny McGuffie (University Contract Students) for conducting the laboratory portion of this study. Plant bioassessment acknowledges Ms. Erika Seals and Ms. Elizabeth Tominey (University Contract Students) for laboratory processing and analysis of sediment and plant tissue. Heavy metals analyses of samples from the plant bioassay were provided by the Analytical Laboratory Group, Environmental Engineering Division, USAE-WES, Vicksburg, Mississippi. All other chemical analyses of sediment, water, and tissues were performed by Dr. Eric Crecelius, Battelle/Marine Sciences Laboratory, Sequim, WA.

At the time of the study, work was conducted under the supervision of Dr. Bobby L. Folsom, Jr., Chief, CMRCG; Mr. Donald L. Robey, Chief, EPED; Dr. John Harrison, Chief, EL, and Mr. Roderick A. Chisholm II, Chief, Environmental Branch, SPN.

At the time of the study, COL Larry Fulton, EN, was Commander and Director during the preparation of this report. Technical Director was Dr. Robert W. Whalin.

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I. INTRODUCTION

Background

Each year the Corps of Engineers dredges sediment from harbors and channels throughout the San Francisco Bay Area to maintain navigation and commerce. Productive use of dredged material to restore and create wetlands has gained more interest in recent years. Suitable dredged material has been used productively in over 120 locations across the U. S. (US Army EM-1110-2-5026). The importance of wetlands to the productivity of estuaries has been realized even more recently in the San Francisco Bay Area. A heightened public interest has emerged to restore wetland acreage that has dwindled away over the past 50 years. Consequently, there has been increased public desire to create and restore wetlands in the San Francisco Bay area in recent years. Dredged material was thought to be of potential value in wetland creation or restoration.

Purpose and Scope

The purpose of this report is to describe the results of a field survey of existing wetland sites in the San Francisco Bay Area and to establish a wetland baseline data set.

Objectives

The objectives of the survey were:

- to identify relatively undisturbed wetlands typical of the San Francisco Bay area;
- 2) to collect samples of the dominant plants, animals (where present) and wetland soil from selected marine and estuarine wetlands in the vicinity of San Francisco Bay;
- 3) to analyze each plant tissue, animal tissue, and soil sample for the presence of contaminants, including toxic heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and butyltin compounds such as Tributyltin (TBT);

4) to document the location and appearance of each of the sampling sites for future reference by map location and through aerial photographs.

II. FIELD SURVEY

Approach

The interpretation of the results of biological and chemical testing of a sediment to evaluate its potential use in wetland creation requires a yardstick (i.e. reference database) for comparison. For this reason, naturally-occurring wetlands in the San Francisco Bay area were identified and the soil/sediment and the indigenous plant and animal communities were sampled. In coordination with personnel of the USACE San Francisco District, sites were selected that are considered to be typical undisturbed wetlands by the District and the Federal and State resource agencies. Unfortunately, since settlement, the San Francisco Bay Area has been the source of anthropomorphic disturbance that has resulted in both modification of the pre-settlement landscape and the introduction of numerous plant and animal species. As a result, it is not always possible to locate the desired species or a sufficient biomass of the desired species for analysis. During the summer of 1990, when the field survey was conducted, animal species, live populations of bivalve mollusks in particular, were not present in either the marine or estuarine wetlands. The paucity of animals has certainly limited the comparative value of the following survey, however, the plant and sediment/soil collections do provide a suitable data base for the establishment of a baseline for wetlands in the San Francisco Bay Area comparison with the species employed in the mesocosm test procedures.

Methods and Materials

<u>Site Selection</u>. The initial selection of the wetlands to be considered was provided by the USACE San Francisco District personnel and consisted of wetlands selected within known wetland refuges and locations generally thought to have been little affected by anthropomorphic activities during recent years, or as in the case of Site 8, the disturbance was well documented and the site was of

interest to the District.

The potential sites were surveyed from the air and if there were no obvious reasons to reject the site, such as proximity to industrial activity, a location within the site was selected for the field sampling (Figure II-1). On several occasions if the helicopter employed by the field collection personnel was not able to land, if the field crew was not able to reach a suitable plant community due to dense vegetation once landed, or if the appropriate plant species were not present, the collection site was relocated as required.

<u>Plant and Animal Identification</u>. Plants and animals collected were identified using appropriate resource materials and reports such as Fernald (1950), Josselyn (1983), and Gosner (1979). Where appropriate, local botanists were consulted to confirm the plant identifications in the field.

Field Collection Technique. Locations of field collections, water salinity, and plant and animal species collected are given in Table II-1. In the marine wetland areas Spartina foliosa and Salicornia subterminalis were the predominate species. Spartina was collected from the low marsh (nearest the water) and Salicornia was collected from the high marsh (the zone inland from the Spartina). In general, two samples of Spartina labeled A and B were collected from the intertidal, low marsh and two samples of Salicornia labeled C and D were collected from the more upland, high marsh. In the estuarine and fresh water areas of the survey, the dominant low and high marsh plants were collected as before, labels A and B designated low marsh and C and D designated high marsh. Due to the variability of the less marine habitats, plant species varied between Typha, Scirpus, and Salicornia, depending on the wetland area. Each sample collected consisted of the amount of plant material that could be encompassed by a 28.7-cm square made from a folding carpenter's ruler, or 823.7 cm2. The plants were clipped 5 cm above the ground. Plant material from each sample was placed in a Ziploc bag or a trash can liner, depending on the amount of vegetation, and placed on ice for shipment to the WES.

After the plants were collected a soil sample of the surface material was collected from each of the sampling locations, A-D. Soil samples were placed in Ziploc bags and placed on ice for shipment to WES. A refractometer was used to measure the salinity of the water.

Any animals suitable as sentinel species were collected at each field collection site. Animal collections represent a composite sample rather than two discrete points within the field site. When a single species was found in sufficient numbers to provide appropriate biomass for chemical analysis, the animals were collected, placed in Ziploc bags and placed on ice for shipment to WES.

At each site the location was plotted on a map (Figures II-2, II-3, and II-4) and an aerial photograph was made of the site, looking north at 30- to 45-m altitude (Figure II-5 - II-16).

Laboratory Procedures. Plant, animal, and soil samples were shipped and stored at 4°C until processed. The plant leaf samples were rinsed three times in reverse osmosis (RO) purified water blotted with paper towels, and weighed. Animal sentinel species (mollusks) were rinsed in RO water and the soft tissues removed from the shells. Only the soft tissues were submitted for chemical analysis. Soil samples were composited to form one sample from each field site. Plant tissue, animal tissue, and soils were placed in acid-washed, hexane-rinsed glassware and shipped at 4°C to Battelle Pacific Northwest Laboratory for chemical analysis. Freeze dried and ground sediment samples were analyzed by energy dispersive X-ray fluorescence for As, Cr, Cu, Ni, Pb and Zn (Nielson and Sanders 1983). The other metals were analyzed by atomic absorption spectrometry (AA) after the sediment was totally dissolved in a mixture of nitric, perchloric and hydrofluoric acids at an elevated temperature (130 degrees C) in a sealed Teflon container. Mercury was quantified by cold vapor atomic absorption spectrometry and the other metals (Ag, Cd and Sb) were quantified by Zeeman graphite furnace AA with matrix modifiers. Sediment and tissue samples were extracted with a mixture of methylene chloride, tropolone and sodium sulfate for

the Tributyltin (TBT) analyses. The extract was derivatized and analyzed by gas chromatography with a flame photometric detector (GC-FPD) similar to the method of Ungery et al. (1986). Sediments were analyzed for base-neutral acids using US EPA Method 625, which indicates solvent extraction, column cleanup and the quantification by GC/MS. The PCBs and DDT were analyzed by US EPA Method 8080 which quantified by GC-ECD. Volatiles were analyzed by US EPA Method 624 using GC/MS. All samples for tributyltin analyses were placed in hexane rinsed and oven-dried amber glass containers and frozen prior to shipping.



Figure II-1. Sampling was Accomplished by Helicopter.

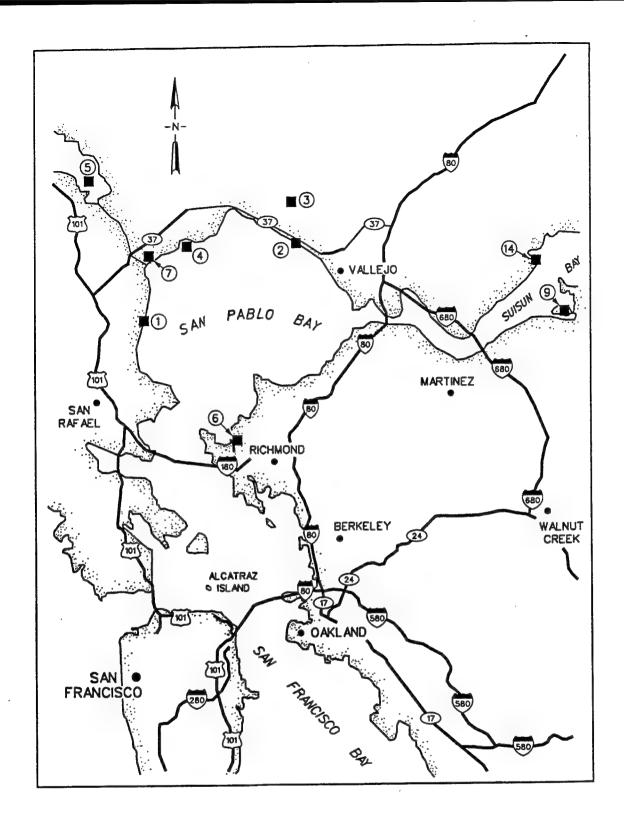


Figure II-2. Field Survey Map for Sites 1-7, 9, and 14.

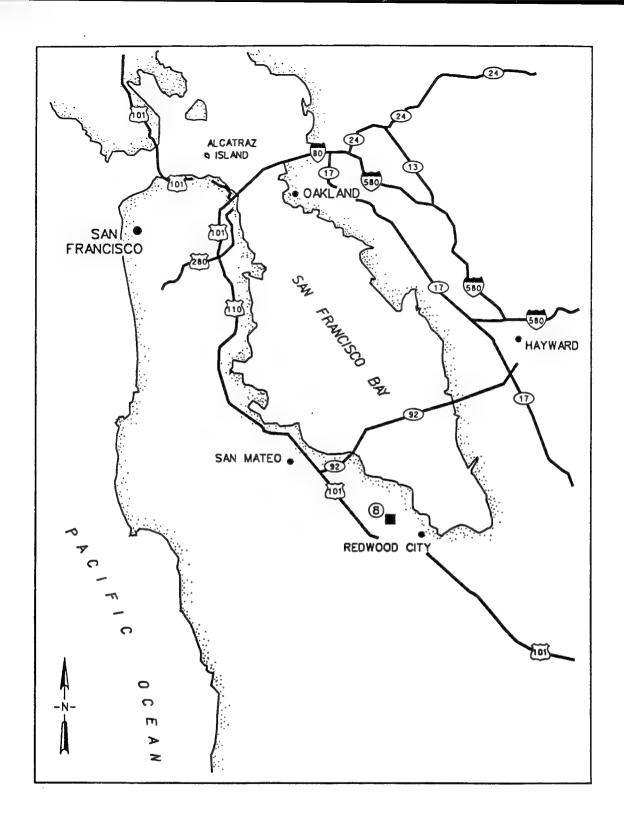


Figure II-3. Field Survey Map for Site 8.

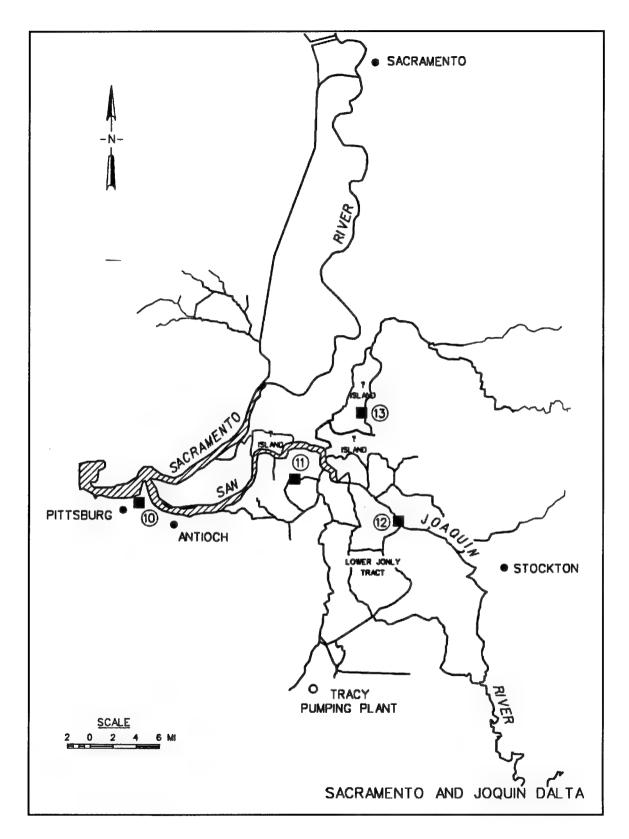


Figure II-4. Field Survey Map for Sites 10-13.

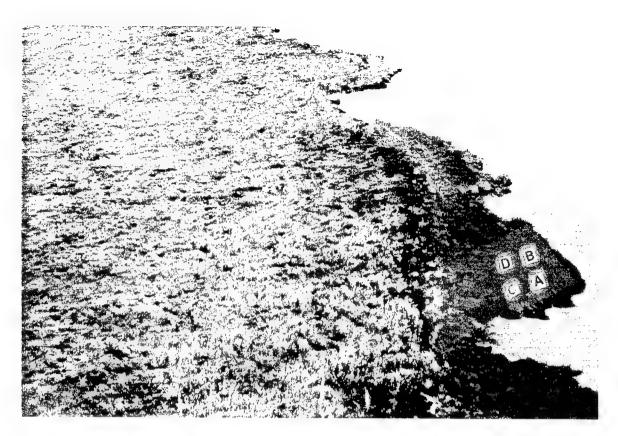


Figure II-5. Field Sampling Site 1 Hamilton Air Force Base (Reference)

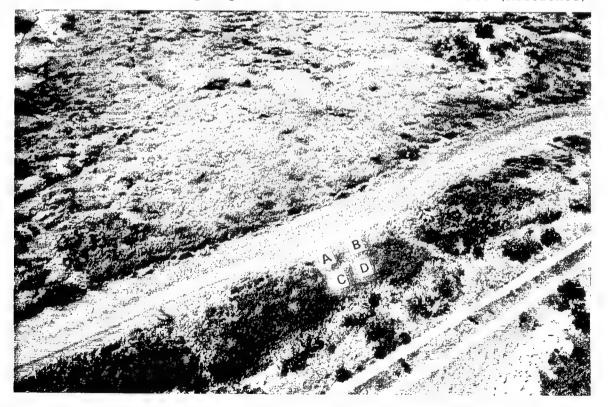


Figure II-6. Field Sampling Site 2 Sears Point Road/ Cullinan Ranch

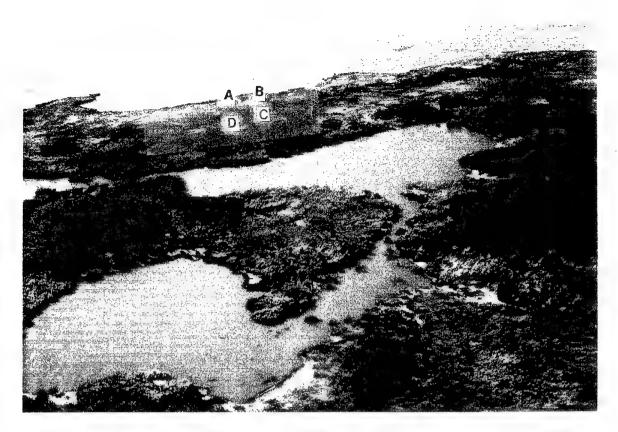


Figure II-7. Field Sampling Site 3 Dutchman Slough/ Cullinan Ranch



Figure II-8. Field Sampling Site 4 Lower Tubbs Island Wetland

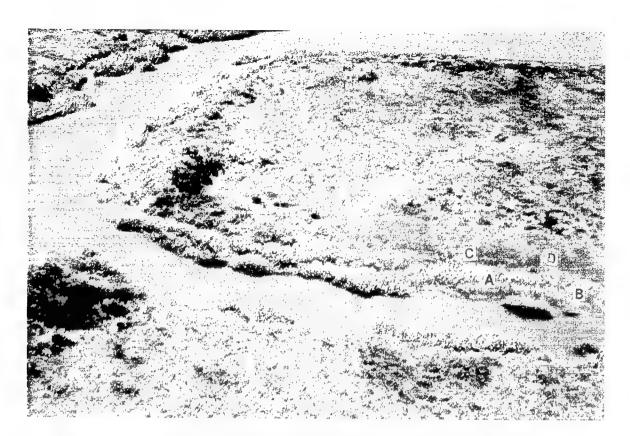


Figure II-9. Field Sampling Site 5 Petaluma Marsh

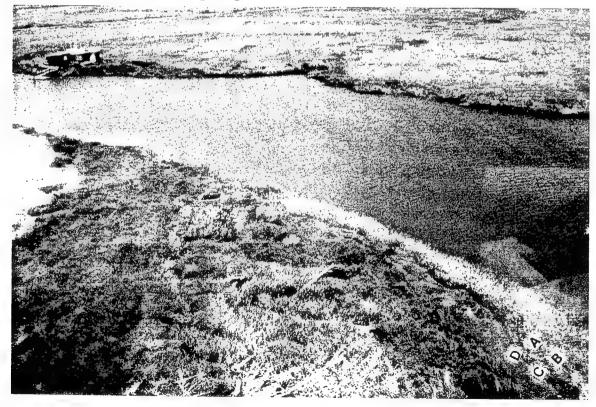


Figure II-10. Field Sampling Site 7 Sonoma Baylands



Figure II-11. Field Sampling Site 8 Deepwater Slough

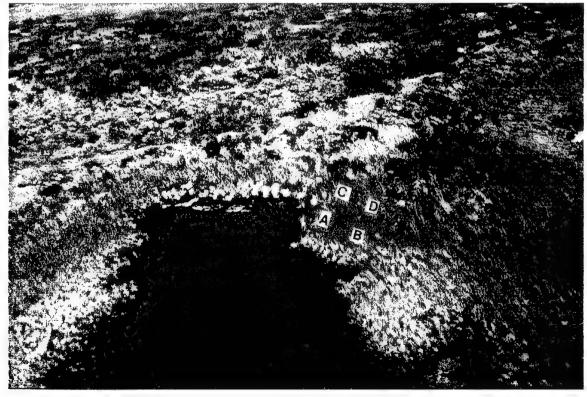


Figure II-12. Field Sampling Site 9 Roe Island, NWS Concord



Figure II-13. Field Sampling Site 10 Browns Island



Figure II-14. Field Sampling Site 11 Near Franks Tract

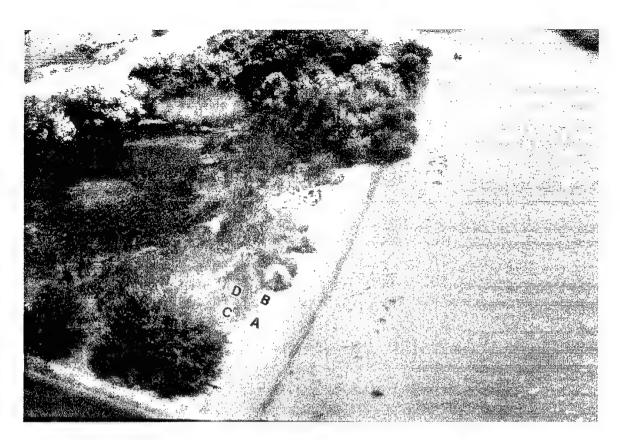


Figure II-15. Field Sampling Site 13 Staton Island, South Fork



Figure II-16. Field Sampling Site 14 Suisun Slough (Reference)

Results and Discussion

Chemical Analysis. Results of the analyses for metal, butyltin, PAH, PCB, and pesticide contaminants are shown in Tables II-2 through II-6. Metal concentrations (Table II-3) represent naturally-occurring background levels for the enormous San Francisco Bay area. These levels of metals result from the presence of heavy metals in the earth's crust, water borne metals, metals in tide water and any atmospheric fallout. These data represent areas thought to be relatively undisturbed, and uncontaminated by agricultural or industrial activities (Site 8 however, was the only disturbed site that had been created from dredged material). While the sediment arsenic concentrations are relatively low and range up to 23.7 mg/kg for site 1 and plant tissue contents are at or below detection limits, those few animals collected had tissue arsenic concentrations approaching or at a FDA-type tissue arsenic content of 10 ug/g (dry weight basis) for mollusks and crustacea used by Australia (Lee et al. 1991). While the few animals sampled in this field survey did not show elevated levels of chromium, zinc or lead, snails collected from the Tiburon area and used in wetland bioassays of dredged material from Oakland Harbor and J. F. Baldwin Ship Channel showed levels of chromium up to 74.9 ug/g, zinc up to 797 ug/g and lead up to 31.6 ug/g (Lee et al. 1994). These bioassays were conducted at the same time of the Field Survey and indicate that chromium, zinc and lead concentrations in certain native wetland animals may be elevated in the San Francisco Bay area. Of particular concern is the lead levels that appear to approach and exceed the 25 ug/g lead concentration established in Australia for human consumption of mollusc. Both Spartina and Salicornia plant species collected during the Field Survey showed tissue lead concentrations up to 4.9 and 5.4 ug/g, respectively. These values approach and exceed the 5.0 ug/g concentration established by the Dutch for mixed animal feed (van Driel et al. 1985). These data suggest that lead contents of some wetland plants and certain wetland animals in existing wetlands may be of concern to the foodwebs associated with these sites in the San Francisco Bay area. The presence of copper at what may appear to be an elevated level in the animals collected at the field sites is likely related to the copper-containing respiratory pigment

characteristic of the Mollusca as a group. The butyltin levels are generally near or below detection limits with the exception of tributyltin in bivalve mollusks (Table II-2). Butyltin values in boldface print are above detection limits. Modiolus collected at Site 1 contained 34.9-38.3 ug/kg tributyltin and Corbicula collected at Site 13 contained 40.7 ug/kg. These levels are the highest determined in any survey animals and probably reflect trace amounts accumulated from the water filtered by these mollusks. Since butyltins do not exist in nature, the levels reported are assumed to be the result of contamination from marine antifouling coatings. PCBs were not found above the detection limits with the exception of some trace amounts of Aroclor 1254 in the wetland soils collected at Sites 1-4 (Table II-4). As noted for butyltin compounds, PCBs are not found naturally in the environment and their presence above detection limits indicates some anthropomorphic contamination. The presence of some PAHs at levels greater than detection in the wetland soils at some sites may also be indicative of anthropomorphic influences (Table II-5). Those PAHs indicated in boldface print are above the detection limits but at the same time they are still relatively low and generally do not exceed 50-100 ug/kg. Pesticides were notably below detection limits with only a few exceptions (boldfaced in Table II-6).

The naturally-occurring wetlands in the San Francisco region that were selected for this survey appeared to be relatively uncontaminated by post-settlement agriculture and industrialization. Even Site 8 constructed on dredged material contained only low levels of the contaminants evaluated. Arsenic tissue contents observed in the few animals collected appeared to be close or at the action level established in Australia for mollusks and crustacea. Further study of arsenic in wetland foodwebs in the San Francisco Bay area appears to be warranted. Likewise, some wetland plants and animals were observed to contain elevated levels of chromium, zinc and/or lead. Lead particularly was observed to approach and exceed tissue lead contents established for plant feed mixes by the Dutch and lead concentrations in mollusks established by the Australian. Further evaluation of chromium, zinc and lead in existing wetlands of San Francisco Bay appears to be warranted.

Although the levels of anthropomorphic contaminants appear to be low, all the selected sites were characterized by a lack of animals, particularly those that could have been used as sentinel species. All the marine sites were characterized by the dead remains of what must have only recently been extensive beds of ribbed mussels. Although the plant communities have survived, there is a need to at least develop a plausible explanation for the lack of living mussels. The introduction and proliferation of a tiny exotic clam from Asia, Potamocorbula amurensis may be a contributing factor. This species out-competes and is a more efficient feeder than existing species. In the brackish and freshwater sites, the clam Corbicula was represented also by many shells and only a few live animals. The invasion of Potamocorbula amurensis also includes brackish waters such as in Suisun Bay. Snails were equally scarce on all sites but Site 8. This lack of animals is quite peculiar since the snails, and mussels are invasive species from the U. S. East Coast, and the clams are an equally opportunistic species from Asia. While it is likely that the introduction of the exotic species (Nassarius, Modiolus, and Corbicula) accompanied some disturbance of the California wetlands, these are very hardy species and would have been expected to survive subsequent disturbances. However, Potamocorbula amurensis could even be out-competing these species. It is realized that the entire San Francisco Bay area has suffered from an extensive drought over the past five years and could have contributed to the observation of few live animal species in the wetlands sampled. Likewise, the faunal component of San Francisco Bay wetlands is not well documented and perhaps the fauna may not be particularly diverse or abundant in the West Coast wetlands.

Table II-1. Wetland Field Survey Site List of Samples Collected.

	Site Location	Samples
-	Hamilton Air Force Base/Antenna Field Natural saltmarsh, 26 ppt. Selected as reference marsh for laboratory tests	Spartina foliosa (2) ⁴ Salicornia sp. (2) Mussels (1) Soil (4)
	Sears Point Road, adjacent to Cullinan Ranch, recent accreted sediment salt marsh, 30 ppt	Spartina foliosa (2) Salicornia sp. (2) Soil (4)
	Dutchman Slough, adjacent to Cullinan Ranch, natural salt/brackish marsh, 22 ppt	Spartina foliosa (2) Salicornia sp. (2) Soil (4)
	Lower Tubbs Island, natural salt marsh 29 ppt	Spartina foliosa (2) Salicornia sp. (2) Soil (4)
i	Petaluma Marsh, natural brackish marsh 27 ppt	Spartina foliosa (2) Salicornia sp. (2) Soil (4)
	Castro Cove, natural salt marsh,	no permission
,	Sonoma Baylands, natural salt marsh, adjacent to potential restoration site 32 ppt	Spartina foliosa (2) Salicornia sp. (2) Soil (4)
3	Deepwater Slough, salt marsh on dredged material, some contamination, 45 ppt	Salicornia sp. (4) Snails (1) Soil (4)
,	Roe Island, NWS Concord, natural brackish marsh, 8 ppt	Scirpus sp. (4) Soil (4)
0	Browns Island, natural brackish marsh, 4 ppt	Typha sp. (4) Soil (4)
11	Near Franks Tract, natural freshwater marsh, a potential restoration site, <2 ppt	Scirpus sp. (4) Soil (4)
12	San Joaquin River, natural freshwater marsh, between Rindge & McDonald tracts	omitted
.3	Staton Island, on South Fork, below Brack tract, freshwater marsh, 0 ppt	Typha sp. (4) Corbicula sp. (1) Soil (4)
14	Suisun Slough, natural brackish marsh, 10-12 ppt, selected as reference marsh for laboratory tests	Scirpus sp. (2) Salicornia sp. (2) Soil (4)

⁺ number of samples

Table II-2. Butyltin Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg dry-weight)

Site	T	etrabutyl Tin	Tributyl Tin	Dibutyl Tin	Monobutyl Tin	
					441	
1	Soil	<1.3	2.3	<1.4	<1.3	
	Plants					
	Spartina a	<4.7	9.2	<4.3	19.8	
	Spartina b	<3.3	<3.7	<3.1	<3.1	
	Salicornia c		<1.8	<1.5	<1.5	
	Salicornia d	<3.2	7.4	<2.9	21.1	
	Animals Modiolus R1	<3.9	34.9	9.3	7.8	
	Modiolus R2	<5.0	38.3	<5.0	<4.6	
	MOGIOIUS RE	~3.0	30.3	٦٥.٠	74.0	
2	Soil	0.5	2.6	3.6	17.0	
	Plants					
	<i>Spartina</i> a	<2.3	<2.5	<2.2	<2.2	
	Spartina b	<3.1	<3.4	<2.9	<2.9	
	Salicornia c	9.7	6.5	<3.5	7.1	
	Salicornia d	<3.2	7.4*	<2.9	12.5*	
_						
3	Soil	3.0	2.6	<1.4	2.9	
	Plants Spartina a	√2 1	2 0	~ 2 1	~1.0	
	Spartina a Spartina b	<2.1 <3.6	2.9	<2.1	<1.9	
	Salicornia c		8.3 3.1	3.7	5.1	
	Salicornia d	3.3	4.8	6.6	15.6	
	Salicolnia d	3.3	4.0	4.4	7.1	
4	Soil Plants	<1.4	3.1	2.0	2.3	
	Spartina a	2.7	5.2	2.5	NA	
	Spartina b	<4.2	<4.6	<3.9	<3.9	
	Salicornia c	3.2	6.0	19.0	64.3	
	Salicornia d	<3.2	7.0*	<2.9	17.6	
5	Soil	41. 2			49.0	
,	Plants	<1.2	3.1	1.7	<1.2	
	Spartina a	<2.2	5.2	<2.2	<2.0	
	Salicornia c		6.0*	<2.7	18.1	
	Salicornia d	54.7	35.8	2.3	5.3	
7	Soil	2.9	2.0	9.6	2.1	
	Plants	-4. 0	-4.4	10.0		
	Spartina a	<4.1	<4.4	<3.8	<3.8	
	Spartina b	<3.3	<3.6	<3.1	<3.1	
	Salicornia c	8.2	9.6*	5.6	6.1	
	Salicornia d	<5.8	12.6*	13.2	<5.3	
В	Soil	2.0	2.3	<1.4	<1.3	
_	Salicornia a	2.4	4.5	2.2	53.5	
	Salicornia b		5.3	<3.1	<2.9	
		2.0	3.5	11.1	24.6	
	Salicornia d		4.0	2.8	2.1	
	Animals	~ 		2.0	4.1	
	Cerithidea?	<1.4	3.5	4.2	1.7	

Table II-2 Concluded. Butyltin Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg dry-weight)

Site		Tetrabutyl	Tributyl	Dibutyl	Monobutyl
		Tin	Tin	Tin	Tin
	Soil	<1.9	3.2	9.6	2.1
9	Plants	<1.9	3.2	3.0	2.1
	Scirpus a	6.1	8.3*	4.6	4.3
	Scirpus b	<3.2	6.5*	<2.9	<2.9
	Scirpus c	<3.8	8.4*	3.6	5.0
	Scirpus d	<5.1	14.7*	6.7	<4.6
	Sciipus u	73.1	44.1	•••	
10	Soil	<1.5	3.6	<1.6	4.7
	Plants				
	Typha a	11.4*	4.7*	2.5*	9.5*
	Typha b	6.1*	5.7*	3.0*	4.1*
	Typha c	11.0*	3.9*	2.8*	<2.2
	Typha d	6.3*	2.2*	3.7*	14.0*
	-22				
11	Soil	<0.9	33.4	<0.9	<0.9
	Plants				
	Scirpus a	<4.1	5.6	5.6	<3.7
	Scirpus b	5.5	5.2	2.6	9.5
	Scirpus c	<2.2	4.1	<2.1	4.4
13	Soil	<0.9	1.8	<0.9	<0.9
	Plants				
	Typha a	13.1*	8.4*	4.4*	7.0*
	Typha b	14.7*	6.8*	4.1*	5.5*
	Typha c	<3.2	<3.6	<3.0	<3.0
	Typha d	18.3*	4.3*	2.3*	3.3*
	Animals				
	Corbicula	14.6	40.7	30.1	11.8
14	Soil	<1.3	3.5	1.8	2.4
	Plants				-
	Scirpus a	1.2	2.2	1.1	NA
	Salicornia c		4.8	2.2	35.1
				<3.0	5.6
	Salicornia d		4.4		

^{*} indicates analyte detected in the blank

Table II-3. Heavy Metal Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in mg/kg dry-weight)

Site		As	Çr	Cu	ŊŢ	Pb	Se	uz	po	Hg	
1	Soil.	23.7	174.0	71.6	102.0	36.3	0.33	137.2	0.33	0.515	
	Plants Spartina a	>0.96	•	9	6.	•	7.	7	. 05	00.	
		<0.86	7.1	4.35	4.34	2.2	<0.64	21.2	0.032	0.015	
	~~	_		6.	0.	•	. 7	∞	.05	.01	
	rnia	0.94		4.	. 7		. 7	9	90.	0.	
					1	١	•	,	-	•	
	Modiolus R1	8.76	4.0	23.1	7.74	1.71	4.19	71.7	3,53	0.398	
	Modiolus R2		•	0	m.	E.	. 5	Ξ.	4.	. 30	
2	Soft	18.5	219.0	90.6	125.4	36.8	0.33	158.9	0.32	0.469	
ı	Plants	•									
	Sparting a	<1.2			9.		8	0	0.	0.	
		<1.1	•		•	•	<0.76	34.8	990.0	02	
	# P	<0.91	-	0	4.	•	.2	0	.16	.01	
	Salicornia d		10.6	13.9	6.07	3.9	<0.78	Ξ.	0.	0.	
8	Soil	18.2	179.0	70.1	145.2	33.0	0.42	166.1	0.41	0.166	
	Plants				1	-	,	1	(•	
	Spartina a	1.27	7.2	13.7	8.76	1.39	<0.63	0.86	0.06	0.022	
	Sparting b		•	е Н		Φ.	9	4	7	. 02	
	ia	1.0		œ	ŗ.	9.	9.	9	0	.01	
	Salicornia d	<0.86	•	•	. 2	6	9.	ა	٥.	. 02	
4	Soil	13.4	214.0	72.6	135.5	35.7	0.17	160.1	0.31	0.439	
ı	Plants								•	,	
	Spartina a	1.82			2.02		<0.68	6.09	0.02	0.014	
	Spartina b	<1.2		6.43		6,	æ.		0.	.01	
	ia	<1.0			7		. 7	s.	. 29	.03	
	Salicornia d	<0.76	4.6	•	9.	<2.10	9.	2	0.	.01	
1		• • •	-		125 0	24 1	30	150 4	90	410	
Ω.	SOLI Dlante	14.4	1/3.0	•			į	9	4	+ F	
	Spartina a	0.99	•				9.	5.	0.	.02	
	Spartina b	-		•	. 2	٦.	ω.	4	. 22	00.	
	Į.	<0.62	8.9	8.6	5.66	2.80	<0.65	15.7	0.039	0.012	
	Salicornia d	<0.88	•	•	₹.	₹.	9.	4	٥.	.01	

Table II-3. Continued. Heavy Metal Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in mg/kg dry-weight)

Site		As	ភ	n	Nİ	Pb	Se	ug	po	Нg	
7	Soil.	10.6	195.0	67.5	119.8	33.8	0.33	157.5	0.33	0.469	
	Frants Spartina a	<1.1	•		2		7	8	.04	00.	
		<0.99	8.9	6.1	7.40	2.7	<0.72	25.5	0.064	0.017	
	Salicornia c	1.14		•	ω.	٣.	9.	9.	.06	.01	
		2.20		•	. 2	•	. 7	7.	~	. 05	
c	Soil	5.29	224.0	35.9	72.2	20.9	<0.14	88.5	0.14	0.074	
	Plants										
	Salicornia a	<0.003			. 7	0.23	<1.10	27.3	0.13	0.024	
	Salicornia b	9	•			4.	. 7	7.	٦.	.01	
		<0.85	4.0		1.48	0.92	9.	9		.03	
		<0.83	0.4	8.9		ω.	9.	9	٦.	.02	
	Animals										
	Cerithidea? 1	11.62		ω.	10.2	1.15	1.33	401.0	1.03	0.180	
			2.1	4	8.5	4.	0.	. 60	0.	.17	
	Cerithidea? 2	2.5	•	23.5		Φ.	1.4	31.	ų.	. 05	
σ	1,08	19.3	m	68.5	107.7	92.6	0.41	142.2	0.28	0.383	
•	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1) (F		4		AF	C	0	
	Soil (dup)	7.07	90	NI.			?			. 3	
	Softons	<0.71		00	. 2	<2.0	9	ij	2	.02	
		<0 82		2	0	C.	9	~		0.	
		< P>	•	•	۲,	ď	٧	0		10	
		<0.79	i m	5.52	1.97	<2.00	<0.58	27.2	0.19	0.024	
			1								
10	Soil	17.2	126.0	67.9	93.3	47.8	0.91	135.0	95.0	0.321	
	Plants										
	Typha a	<0.79		0.	7	•	9.	6	.03	.01	
	Typha b	<0.77	<3.6	4.95	2.16	<1.9	<0.63	17.8	0.067	0.026	
	Typha c	<0.79		5.3	9		9.	œ	.05	. 02	
	Typha d	<0.87	•	۲.	3	•	9	ä	. 10	. 01	

Concluded. Heavy Metal Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in mg/kg dry-weight) Table II-3.

15.3 0.87 <0.89 <0.79 <0.84 5.36 <0.91 <0.91 <0.87 <0.87 <0.83								•
Scirpus a 0.87 Scirpus b <0.89 Scirpus c <0.79 Scirpus d <0.84 Soil Typha a <0.91 Typha b <0.9 Typha c <0.9 Typha d <0.83 Animals Corbicula 10.79 Soil Plants Scirpus a <0.79		50.3	83.3	13.7	0.16	89.8	0.22	0.283
Scirpus b <0.89 Scirpus c <0.79 Scirpus d <0.84 Soil Plants Typha a <0.91 Typha b <0.9 Typha c <0.87 Typha d <0.87 Typha d <0.87 Typha d <0.83 Animals Corbicula 10.79 Soil Plants Scirpus a <0.79	87	31.1	6.70	0.87	<0.62	80	0 17	
Scirpus c <0.79 Scirpus d <0.84 Soil Plants Typha a <0.91 Typha c <0.9 Typha c <0.87 Typha d <0.87 Typha d <0.87 Soil Plants Soil Plants Scirpus a <0.79	.89 4.0	17.4	9.39	1.03	<0.65	133 0	74.0	0.00
Scirpus d <0.84 Soil Plants Typha a <0.91 Typha c <0.9 Typha d <0.8 Typha d <0.8 Animals Corbicula 10.79 Soil Plants Scirpus a <0.79	79	15.3	4.47	0.49	<0.56	200	77.0	* 0
Soil Plants Typha a <0.91 Typha b <0.9 Typha c <0.87 Typha d <0.87 Typha d <0.83 Animals Corbicula 10.79 Soil Plants Soil Plants Soil Plants	84	13.6	5.81	0.76	<0.61	59.3	0.13	0.028
Typha a <0.91 < Typha b <0.9 Typha c <0.87 < Typha d <0.87 < Typha d <0.83 < Animals Corbicula 10.79 Soil Plants Scirpus a <0.79 Soil Flants	.36 110.0	24.2	32.2	14.0	<0.14	161.7	0.55	0.029
Typha b <0.91 Typha c <0.87 Typha d <0.87 Typha d <0.83 Animals Corbicula 10.79 Soil Plants Scirpus a <0.79								\ > •
Typha b <0.9 Typha c <0.87 < Typha d <0.83 < Animals Corbicula 10.79 Soil Plants Scirpus a <0.79		9.41	7.40	4.0	<0.66	61.0	0.13	0.014
Typha c <0.87 < Typha d <0.83 < Animals Corbicula 10.79 Soil Plants Scirpus a <0.79		7.59	9.40	2.3	<0.63	93.6	0 14	410.0
Typha d <0.83 < Animals Corbicula 10.79 Soil Plants Scirpus a <0.79		5.12	4.27	2.8	<0.62	36.2		0.0
Soil 16.9 19 Soil Plants Scirpus a <0.79		4.0	8,31	<2.1	<0.62	98.8	0.09	0.010
Soil Plants Scirpus a <0.79			c c	•	(,		
Soil 16.9 Plants Scirpus a <0.79	۲۰ a. y.	104.1	5.78	1.89	3.98	273.0	3.34	0.469
<0.79	9 193.0	77.3	122.1	32.5	0.25	164.7	0.36	0.362
***	79	7.7	3.47	1.18	<0.5R	48 4	0	c
26.05 3		10.1	3.78	0.99	<0.70	•		2 0
95	95	11.4	1.85	0.71	<0.71	29.8	0.07	0.00

Site		Aroclor	Aroclor	Aroclor	Aroclor	Aroclor	Aroclor	Aroclor	
		1016	1221	1232	1242	1248	1254	1260	
	Soil	<30	<30	<30	<30	<30	150	<30	
		001,	7	901/	<100	<100	<100	<100	
	Sparting a	7100	<100	<100	<100	<100	<100	<100	
		×100	<100	<100	<100	<100	<100	<100	
	Salicornia d	<100	<100	<100	<100	<100	<100	<100	
	Animals bl	<100	<100	<100	<100	<100	<100	<100	
		<100	<100	<100	<100	<100	<100	<100	
2	Soil	<30	<30	<30	<30	<30	83	<30	
ı	t8	<100	<100	<100	<100	<100	<100	<100	
	Sparting b	<100	<100	<100	<100	<100	<100	<100 <20	
	Salicornia c Salicornia d	<20 <100	<20 <100	<100	<100	<100	<100	<100	
m	Soil	<30	<30	<30	<30	<30	210	<30	
•	ts .	000	977	002	<20	<20	<20	<20	
	Spartina a	<20 <20 <20	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	420	<20	<20	<20	<20	
	i d		<20	<20	<20	<20 <20 <20	<20 <20 <20	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
	Salicornia d		<20	<20	<20	075	075	720	
4	Soil	<30	<30	<30	<30	<30	120	<30	
		,	50	<20	<20	<20	<20	<20	
	Sparting a	<100	<100	<100	<100	<100	<100	<100	
	2 4	<20	<20	<20	<20	<20	<20	<20 20 20 20 20 20 20 20 20 20 20 20 20 2	
	Salicornia d		<100	<100	<100	<100	<100	<100	
in.	Soil	<30	<30	<30	<30	<30	<30	<30	
i	Plants		. (001	007	720	000	<20	
	Spartina a	<20 <100 <100	<100	<100	<100	<100	<100	<100	
	· •••• •	<100	<100	<100	<100	<100 <100 <100 <100 <100 <100 <100 <100	<100 <100 <100	<100 <100	
	Salicornia		220	075	77/				

Table II-4 Continued. PCB Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

									-
Site		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	
7	Soil	<30	<30	<30	<30	×30	<30	<30	
	ina	<100	<100	<100	<100	<100	<100	<100	
	Spartina b	V 100	~100	V100	V 100	×100 ×100	<100 <100	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
	Salicornia	<100	<100	<100	<100	<100	<100	<100	
c o	Sofl	<30	<30	<30	<30	<30	<30	<30	
		Ġ,	ç	9	000	,	,	0	•
	Salicornia	770	770	770	770	077	077	077	
		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<20 <20 <20	<20 <20	<20 <20	420 420	<20 <20	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
	Salicornia d	<20	<20	<20	<20	<20	<20	<20	
	Animals								
	Cerithidea? 1	<100	<100	<100	<100	<100	<100	<100	
	Cerithidea? 2	<100	<100	<100	<100 <	<100	<100	<100	
σ	Soil	<30	<30	<30	<30	<30	<30	<30	
	Plants		,		1	1			
		001V	0017	0017	0017	0017	0017	0 0 0 0 V V	
	Scirpus D	V100	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	×100	×100	×100	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	7700	
		<100	<100	<100	<100	<100	<100	<100	
10	Sof1	<50	<50	<50	<50	<50	<50	<50	
	Plants								
		<100	<100	<100	<100	<100	<100	<100	
		<100 100 100	00IV	V100	V100	×100 ×100	001V	×100	
	Typna c	<100	V V	<100	×100 ×100	<100	×100	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
)			
11	Soil	<30	<30	<30	<30	<30	<30	<30	
	Plants	•		•	•		•	;	
		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	750 750	750 750	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<20 <20 <20 <20 <20 <20 <20 <20 <20 <20	<20 <20 <20 <20 <20 <20 <20 <20 <20 <20	420	
		072	070	077	027	070	022	025	
	Scirpus	07V	7,00	077	07V	077	077	022	
	Scirpus d	240	770	740	7.0	720	075	075	

Concluded. PCB Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-4

Site		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	
13	Soil	<30	<30	<30	<30	<30	<30	<30	
	Typha a	<100	×100	<100	<100	<100	<100	×100	
	Typha o	<100	100	<100	<100	<100	<100	<100	
	Typha d	<100	<100	<100	<100	<100	<100	<100	
	Animais Corbicula	<100	<100	<100	<100	<100	<100	<100	
14	Soil	<30	<30	<30	<30	<30	<30	<30	
	Plants Scirpus a Salicornia c	<20 <20 <20	<20 <20 <20	<20 <20 <20	<20 <20 <20		<20 <20 <20	<20 <20 <20	
	Salicornia d	<20	<20	02>	07>	07>	07>	07>	

Table II-5. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Site		Acenaph- thene	Acenaph- thylene	Anthr- acene	Benzo(a) Anthracene	Benzo[b] Fluoranthene	Benzo(k)	Benzo[a] Pyrene
·	Soil Plants	12	15	38	100	96	82	130
	Spartina a	<10	<10	<10	<10	<10	<10	<10
	Spartina b	<10	<10	<10	<10	<10	<10	<10
	Salicornia c	<10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	<10	<10
	Animals							
	Modiolus R1	<10	<10	<10	<10	<10	<10	<10
	Modiolus R2	<10	<10	<10	<10	<10	<10	<10
2	Soil	<10	<10	15	41	58	44	63
	Plants							
	Spartina a	<10	<1.0	26	<10	<10	<10	<10
	Spartina b	<10	<10	<10	<10	<10	<10	<10
	Salicornia c	<10	<10	<10	<10	<10	<10	<10
	Salicornia d	<10	<10	<10	<10	.<10	<10	<10
~	Sofi	<10 <10	<10	<10	. 23	40	26	68
•	Plants	•)		[}))
	Spartina a	<10	<10	<10	<10	<10	<10	<10
	Spartina b	<10	<10	<10	<10	<10	<10	<10
	ia	<10	<10	<10	<10	<10	<10	<10
	Salicornia d	<10	<10	<10	<10	<10	<10	<10
4	i jos	<10	<10	52	47	67	20	80
•	Plants							•
	Spartina a	<10	<10	<10	<10	<10	<10	<10
	Spartina b	<10	<10	<10	<10	<10	<10	<10
	ţa	<10	<10	<10	<10	<10	<10	<10
	Salicornia d	<10	<10	<10	<10	<10	<10	<10

Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-5

Site		Acenaph- thene	Acenaph- thylene	Anthr- acene	Benzo(a) Anthracene	Benzo[b]	Benzo[k] e Fluoranthene	Benzo[a] Pyrene
25	Soil	<10	<10	<10	<10	<10	<10	<10
	Plants Chertine a	×10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	<10	<10
	7	<10	<10	<10	<10	<10	<10	<10
	Salicornia d	<10	<10	<10	<10	<10	<10	<10
-	Soil	<10	<10	16	19	82	72	98
	18	,	97	V10	<10	<10	<10	<10
	Sparting a		017	010	<10	<10	<10	<10
	Sparting D	×10 ×10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	<10	<10
a	Soft	<10	<10	<10	<10	15	11	11
Þ	Plants		,	•	•	6	,	,
		<10	<10	×10	010	017	710	7.7
		<10	<10	01v	017	010	710) T
	Salicornia c	<10	<10	<10	01>	015	01/	7 7
	Salicornia d	<10	<10	<10	<10	<10	01>	01>
		•	,	5	V.	<10	<10	<10
	Cerithidea? 2	×10 ×10	410 410	<10 <10	<10	<10	<10	<10
Ø.	Soil	<10	<10	11	26	83	67	62
		710	610	<10	<10	<10	<10	<10
	SOLLIPES A	<10 <10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	<10	<10
	Scirbus d	<10	<10	<10	<10	<10	<10	<10
10	Sofl	. 19	120	16	150	211	150	130
	Plants Tunha a	<10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	<10	<10
		<10	<10	<10	<10	<10	010	010
	Typha d	<10	<10	<10	610	015	01>	

Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-5

Site		Acenaph- thene	enaph- Acenaph- hene thylene	Anthr- acene	Benzo[a] Anthracene	Benzo[b] Fluoranthene	Benzo[k] Fluoranthene	Benzo[a] Pyrene
11	Soil Plants	<10	<10	<10	<10	<10	<10	<10
	Scirpus a	<10	<10	<10	<10	<10	<10	<10
	Scirpus p	<10	<10	<10	<10	<10	<10	<10
	Scirpus c	<10	<10	<10	<10	<10	<10	<10
	Scirpus d	<10	<10	<10	<10	<10	<10	<10
13	Soil	<10	<10	<10	29	18	20	22
	Typha a	<10	<10	<10	<10	<10	<10	<10
	Typha b	<10	<10	<10	<10	<10	<10	<10
	Typha c	<10	<10	<10	<10	<10	<10	<10
	<i>Typha d</i> Animals	<10	<10	<10	<10	<10	<10	<10
	Corbicula	<10	<10	<10	<10	<10	<10	<10
14	Soil Plants	<10	<10	<10	11	. 18	13	16
	Scirpus a	<10	<10	<10	<10	<10	<10	<10
	nia	<10	<10	<10	<10	<10	<10	<10
	Salicornia d	<10	<10	<10	<10	<10	<10	<10

Table II-5 Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Site		Benzo [g,h,i] perylene	Chrysene	Dibenzo [a,h] anthracene	Fluor- anthene	Fluorene	Ideno- 1,2,3- pyrene	2-Methyl- Naph- thalene	Naph- thalene
	Soil	110	100	19	190	<10	66	30	61
	Plants Sparting a	<10	<10	<10	<10	15	<10	29	63
		<10	<10	<10	<10	<10	<10	<20	42
	3 4	×10	<10	<10	<10	<10	<10	20	20
	Salicornia d	<10	<10	<10	<10	<10	<10	<20	<50
	Animals						1	,	•
	Modiolus R1	<10	<10	<10	<10	<10	<10	45	120
	Modiolus R2	<10	<10	<10	<10	<10	<10	<30	19
2	Soil	89	51	10	94	<10	29	27	53
l	Plants			-	,	•	•	i	t v
	Spartina a	<10	<10	~10	<10	<10	<10	77	000
	Spartina b	<10	<10	<10	<10	<10	<10	32	<50
	ia	<10	<10	<10	<10	<10	<10	24	61
	Salicornia d	<10	<10	<10	<10	. <10	<10	37	φ Φ
m	Soft	23	27	<10	54	<10	43	35	64
		•	,	. 011	01/	017	<10	2.4	89
		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \) V	017	27.	017	×10	6 6	000
		01v			01.	012	×10	<20	<50
	Salicornia d Salicornia d	<10	<10 <10	<10	<10	<10	<10	78	83
4	Soil	88	23	11	110	<10	77	25	20
		•	,	~	917	017	012	<20	<550
		017	017	210	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	×10	017	30	
		017) TO	VI.	<10	<10	<10	25	73
	Salicornia d	<10	<10	<10	<10	<10	<10	<20	
ĸ	Soil	<10	<10	<10	<10	<10	<10	15	34
		917	017	<10	010	<10	<10	25	89
	Sparting a	×10 ×10	<10	<10	<10	<10	<10	<20	<50
	ુખ	<10	<10	<10	<10	<10	<10	<20	30
	Salicornia d	<10	<10	<10	<10	<10	<10	24	26

Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-5

Marche	Site		Benzo [g,h,i] perylene	Chrysene	Dibenzo [a,h] anthracene	Fluor- anthene e	Fluorene	Ideno- 1,2,3- pyrene	2-Methyl- Naph- thalene	Naph- thalene
Spartina a Stationaria control of the Spartina b Stationaria control of the Spartina b Stationaria control of the Spationaria control of the Control of the Spationaria control of the Control of the Spationaria control of the Control	7	Soil Plants	100		15	120	<10	81	12	76
Soil Solitation a < 10		ina	<10	<10	<10	<10	<10	<10	28	54
Salicornia c < 10			<10	<10	<10	<10	<10	<10	<20	28
Soil 15			<10	<10	<10	<10	<10	<10	<20	30
Soil Plants			<10	<10	<10	11	<10	<10	<20	30
Plants P	&	Soil	15	15	<10	18	<10	11	<10	56
Salicornia a cito <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10		Plants								
Salicornia b <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			<10	<10	<10	<10	<10	<10	30	16
Salicornia c <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <t< td=""><td></td><td></td><td><10</td><td><10</td><td><10</td><td><10</td><td><10</td><td><10</td><td>28</td><td>83</td></t<>			<10	<10	<10	<10	<10	<10	28	83
Animals Cerithidear 1 < 10 < 10 < 10 < 10 < 10 Animals Cerithidear 2 < 10 Cerithidear 2 <			<10	<10	<10	<10	<10	<10	25	89
Soil Plants Scirpus a		rnia	<10	<10	<10	<10	<10	<10	78	68
Soil Plants Scirpus a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10		idea?	<10	<10	<10	<10	<10	<10	<30	09>
Soil <10 <10 17 56 83 67 Plants Scirpus a Scirpus b <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			<10	11	<10	<10		<10	<30	09>
Plants < 10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10	Ø	Soil	<10	<10	17	26	83	67	NA	62
Scirpus a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <		Plants								
Scirpus b <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <			<10	<10	<10	<10	<10	<10	NA	<10
Scirpus c <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <			<10	<10	<10	<10	<10	<10	NA	<10
Soil 19 120 97 150 <10 <10 Plants Typha a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			<10	<10	<10	<10	<10	<10	NA	<10
Soil 19 120 97 150 211 150 Plants <10			<10	<10	<10	<10	<10	<10	NA	<10
Plants <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10<	0	Soil		120	76	150	211	150	NA	130
Typha a <10		Plants								
Typha b <10			<10	<10	<10	<10	<10	<10	NA	<10
Typha c <10			<10	<10	<10	<10	<10	<10	NA	<10
Soil Plants Scirpus a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			<10	<10	<10	<10	<10	<10	NA NA	<10
Soil <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			<10	<10	<10	<10	<10	<10	NA	<10
us a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <10 <td>#1</td> <td>Soil</td> <td><10</td> <td><10</td> <td><10</td> <td><10</td> <td><10</td> <td><10</td> <td>NA</td> <td><10</td>	#1	Soil	<10	<10	<10	<10	<10	<10	NA	<10
a <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			,	,	,	•	,	•	;	•
b <10 <10 <10 <10 <10 <10 <10 <10 <10 <10			01>	01>	01>	01>	01>	01>	NA	<10
d <10 <10 <10 <10 <10 <10 <10 <10			<10 10 10 10 10 10 10 10 10 10 10 10 10 1	<10 <10	~10 /10	<10	<10	<10 <10	NA	<10
OTS OTS OTS OTS OTS D			017	01°	710	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	010	010	NA	<10 <10
			015	015	015	01>	01>	01>	NA	0T>

Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-5

Site		Benzo [g,h,i] Perylene	Chrysene Dibenzo [a,h] anthrac	Dibenzo [a,h] anthracene	Fluor- anthene	Fluorene	Ideno- 1,2,3- Pyrene	2-Methyl- Naph- Naph- thalene	- Naph- thalene
E.	Soil	<10	<10	<10	29	18	20	NA	22
	Plants	•	5,	917	<10	<10	<10	NA	<10
	Typna a	017		217	<10	<10	<10	NA	<10
	Typna D			21.7	<10	<10	<10	NA	<10
	Typha c Typha d	×10 ×10	<10	<10 <10	<10	<10	<10	NA	<10
	Animals Corbicula	<10	<10	<10	<10	<10	<10	NA	<10
4	Soil	<10	<10	<10	11	18	13	NA	16
	Plants Scirpus a	V10	×10	×10	<10	<10 <10	<10	NA NA	<10 <10 <10
	Salicornia d Salicornia d	<10 <10	<10	<10	<10	<10	<10	NA	<10

NA - not available

Table II-5 Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Table II-5 Continued. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

	dq.	Phenanthrene	Pyrene	
Site	•			
7	Soil	45	160	
•	plants			
	ina	37	<10	
		12	12	
	To the	<10	<10	
	Salicornia d	<10	12	
		•	C	
80	Soil	<10	07	
,	Plants			
	ornia	16	OTS	
		12	<10	
		20	<10	
	Dalicolita Calicolita	15	<10	
	77177	}		
		•		
	ea?	<10	01/	
	Cerithidea? 2	<10		
•	Soil	20	S.A.	
`	plants			
	200	17	19	
	T CHAIR TO	- C	11	
		0 0	19	
		9 •	-10	
	Scirpus d	11		
		76	240	
10	TIOS	2		
		7	<10	
	Typha a	OIS	200	
	Typha b	<10		
	Typha C	11	01>	
	The day	20	<10	
	n nudfr			
•	1,00	<10	<10	
17	1 C C C C C C C C C C C C C C C C C C C			
	V.	18	<10	
	Series D	18	<10	
		10	<10	
		14	<10	
	p sndrips			

Table II-5 Concluded. PAH Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Site		Phenanthrene	Pyrene	
13	Soil Plants	20	46	
	Typha a	12	10	
	Typha c	18 <10	<10 <10	
	Animals Corbicula	<10	<10	
14	Soil	13	33	
	us a	^10 ^10	<10	
	Salicornia d	<10	<10	

Table II-6 Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Addrin a-BHC D-BHC G-BHC 9-BHC 1-BHC					9	7	21.0	26102	A A.	- V V	- P P
Soil	Site		Aldrin	a-BHC	b-BHC	d-BHC	д-вис	dane	#,4- DDD	DDE	 TOO
Plants Spartina a C20	1	Soil	<3.0	<3.0	<3.0	<3.0	<3.0			<3.0	<3.0
Spartina b		Plants	•	9	900	001	001	730	000	<20	<20
Soli Salicornia d			0 5 0 7 7 0	770	077	02×	<20 <20 <20	\?30 \\	<20	<20	<20
Salicornia d		Ω .	077	200	200	25°	<20	<30	<20	<20	<20
Animals Animals Andmals Modicius R2 Modicius R2 Animals Soil Plants Spartina a Soil Spartina a Soil Spartina a Soil Animals Soil Animals Animals Soil Animals		rnia	<20 <20 <20	<20	420	<20	<20	<30	<20	<20	<20
Modiolus R1			•	,	,	2,	7	V10	<10	<10	<10
Soil			<10 <10	<10	<10 <10	<10	<10	<10	<10	<10	<10
Plants Spartina a	2	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Spartina a <20 <20 <20 <20 <20 <20 <20 <20 <20 <20	ı	Plants	,	•	9	,	,	00/	00%	627 0	<20
Salicornia d			<20 /30	V 750	250	077	022) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4	<20 <20 <	\ \ \ \ \ \ \	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
Salicornia d <20		ָם	077	200	0 C V	× × × × × × × × × × × × × × × × × × ×	<20	<30	<20	<20	<20
Soil Plants Soil Soil Soil Soil Sharts Soil Salicornia a <pre></pre>			<20 <20	<20	<20 <20 <20	<20	<20	<30	<20	<20	<20
Spartina a	(~	Soil	<3.0	<3.0	<3.0	\$	<3.0	× × ×	<3.0	<3.0	
Spartina a <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0	ז	plants			•		•	ç	,	,	,
Soil Spartina b <pre></pre>		ina	<2.0	<2.0	<2.0		0.2×	0.25		74.0	•
Soil cornia c <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0			<2.0	<2.0	<2.0		<2.0	<2.0		0.27	×2.0
Soil Plants Sparting a		E .	<2.0	<2.0	<2.0		<2.0	<2.0		0'7>	<2.0 0.2>
Soil Plants Plants Spartina a 22.0			<2.0	2.3	<2.0		<2.0		<2.0	<2.0	<2.0
Sparting a C2.0 C	•	i co	<3.0	<3.0		♡		×			
Spartina a <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0	•	Plants	•			•					
Spartina b <20 <20 <20 <20 <20 <20 <20 <20 <20 <20		Spartina a	<2.0	<2.0							
Salicornia c <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0		Sparting b	<20	<20			•				
Soil Salicornia d <20 <20 <20 <20 <30 <30 <20 <20 <20 <20 <20 <20 <20 <20 <3.0 <3.0 <3.0 <3.0 <3.0 <3.0 <3.0 <3.		8	<2.0	<2.0					<2.0	<2°.	<2.0
Soil			<20	<20				<30	<20	<20	<20
ina a contract <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0<	ហ	Soil	<3.0	<3.0				<3.	<3.0		<3.0
h <2.0 <20 <20 <20 <20 <20 <20 <20 <20 <20 <2			(•				C	<2.0		<2.0
ta c <20 <20 <20 <20 <20 <20 <20 <20 <20 <20			0.25 2.0	0.25 20.05	•	٧	V	<30	<20		<20
d <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0 <2.0		2 9	<20	<20	<20	<20	<20	<30	<20		<20
			<2.0 <2.0	<2.0	<2.	<2.	<2	<2.	7		0 <2.0

Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-6

Site		Aldrin	а-ВИС	р-внс	d-BHC	9-внс	Chlor- dane	4,4- DDD	4,4- DDE	4,4- DDT
7	Soil Plants Spartina a Spartina b Salicornía c	<pre><3.0 <20 <20 <20 <20 <20 <20 </pre>	<pre><3.0 <20 <20 <20 <20 <20 <20 <20 <20 <20 <2</pre>	<pre><3.0 <20 <20 <20 <20 <20 <20 <20 </pre>	<pre><3.0 <20 <20 <20 <20 <20 <20 </pre>	<3.0 <20 <20 <20 <20	<3.0 <30 <30 <30 <30	<3.0 <20 <20 <20 <20	3.6 <20 <20 <20 <20	<3.0 <20 <20 <20 <20
60	Soil Plants Salicornia a Salicornia b Salicornia c Animals	\$3.0 \$2.0 \$2.0 \$2.0 \$2.0	\$25.0 \$25.0 \$25.0 \$25.0	\$3.0 \$2.0 \$2.0 \$2.0 \$2.0 \$2.0	<pre></pre>	<pre><3.0 <2.0 <2.0 <2.0 <2.0 <2.0 </pre>	43.062.062.062.063.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.064.0<	\$2.0 \$2.0 \$2.0 \$2.0	0.000.00 0.000.00 0.000.00	A
90	Soil Plants Scirpus a Scirpus b Scirpus c Scirpus d	<110 <3.0 <20 <20 <20	<10 <10 <10 <10 <10 <10 <10 <10 <10 <10	<pre><10 <3.0 <20 <20 <20 <20 <20 </pre>	<pre><10 <10 <20 <20 <20 <20 <20 <20 <20 <20 <20 <2</pre>	<10 <3.0 <20 <20 <20 <20 <20	<pre><10 <33.0 <330 <330 <330 <330 <300 <300 <3</pre>	<10 <3.0 <20 <20 <20 <20 <20 <20	<pre><10 <10 <10 <10 <10 <10 <10 <10 <10 <10</pre>	<10 <10 <10 <10 <10 <10 <10 <10 <10 <10
10	Soil Plants Typha a Typha b Typha c	<pre><5.0 <20 <20 <20 <20 <20 </pre>	<pre></pre>	<pre></pre>	<pre></pre>	<pre><5.0 <20 <20 <20 <20 <20 </pre>	<pre><5.0 <30 <30 <30 <30 <30 <30 <30 <30 <30 <3</pre>	<pre></pre>	<pre></pre>	<pre></pre>
11	Soil Plants Scirpus a Scirpus b Scirpus c	<pre><3.0 <3.0 <22.0 <22.0 <22.0 </pre>	\$25.00 \$25.00 \$25.00 \$25.00	\$3.0 \$2.0 \$2.0 \$2.0 \$2.0	<pre></pre>	<pre><3.0 <22.0 <22.0 <22.0 </pre>	<pre><3.0 <2.0 <2.0 <2.0 <2.0 </pre>	3.062.062.062.0	A3.0 62.0 62.0 62.0	0.0000 7.2000 7.2000 7.2000

Table II-6 Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg Wet-Weight)

Site		Aldrin	a-BHC	b-BHC	d-BHC	g-BHC	Chlor- dane	4,4- DDD	4,4- DDE	4,4- DDT
ю.	Soil Plants	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Typha a	<20	<20	<20	<20	<20	<30	<20	<20	<20
	Typha b	<20	<20	<20	<20	<20	<30	<20	<20	<20
	Typha c	<20	<20	<20	<20	<20	<30	<20	<20	<20
	<i>Typha d</i> Animals	<20	<20	<20	<20	<20	<30	<20	<20	<20
	Corbicula	<10	<10	<12	<24	<10	<10	<10	<115	<30
14	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Scirpus a	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Salicornia c	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Salicornia d	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Continued. Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight) Table II-6

Site		Dieldrin	Endo-	Endo-	Endo-	Endrin	Hepta-	Hepta-	Meth-	Toxa-	
			Bulran I	II	Sulfate	Ataenyae	CUTOL	chior Epoxide	chlor	pnene	
1	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200
	Plants Spartina a	<20	<20	<20	<20	<20 <	<30		<20		<200
		<20	<20	<20	<20		<30	<20	<20	<20	<200
	Salicornia c	<20	<20	<20	<20		<30		<20		<200
	Salicornia d	<20	<20	<20	<20		<30	<20	<20	<20	<200
	Animals Modicine Di	017	<10 <	<10	×10	<10	<10	<10	<10	<10	<500
		<10	<10	<10	<10		<10		<10		<500
7	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	×3.0	<3.0	<200
	Sparting	<20	<20	<20	<20	<20	<30	<20	<20	<20	<200
		<20	<20	<20	<20		<30		<20	<20	<200
	1 4	<20	<20	<20	<20		<30		<20	<20	<200
	Salicornia d	<20	<20	<20	<20		<30		<20	<20	<200
m	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200
	Sparting a	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<200
		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<200
	~~	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<200
		<2.0	2.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<200
4	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<200
	Flants Spartina a	<2.0	<2.0	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0	<200
		<20	<20	<20	<20		<30		<20	<20	<20
	ia	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Salicornia d	<20	<20	<20	<20		<30		<20	<20	<20

rable II-6 Continued. Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg wet-weight)

Site	Ę	Dieldrin	Endo- sulfan I I	Endo- sulfan II	Endo- sulfan Sulfate	Endrin	Endrin Aldehyde	Hepta- chlor	Hepta- chlor Epoxide	Meth- oxy- chlor	Toxa- phene
S.	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
		<25.0 <20 <20 <20	<2.0 <20 //	<20.0 <20 <20	<25.0 <20 <20	<20.0 <20 <20	<2.0 <30 <30	<2.0 <20 <20	<2.0 <20 <20	<2.0 <20 <20	<22.0 <20 <20
	Salicornia c Salicornia d	<25.0 <2.0	<2.0 <2.0	62.0	0.	× × × × × × × × × × × × × × × × × × ×	22.0	6.2.0	0. 4	<2.0	<2.0
۲	Soil Plants Spartina a	<3.0	<3.0	<3.0 <20	<20	<20 <20 <20	30°5°	<20 73.0	×20 ×20 ×20	2000	, V20 , V20 , V20
	Spartina b Salicornia c Salicornia d	\$ 50 0 \$ 50 0 50 0	<20 <20 <20	420 420 420	0 0 0 0 0 0 0 0 0 0	<20 <20 <20		<20 <20 <20		× × × × × × × × × × × × × × × × × × ×	\20 \20 \20 \20
œ	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Plants Salicornia a Salicornia b	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	<2.0 <2.0 <2.0		<pre><2.0 <2.0 <2.0</pre>	<pre></pre>	<pre></pre>	<pre></pre>	<pre><2.0 <2.0 <2.0 </pre>	<pre></pre>	<pre></pre>
	600 600		<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10	<2.0 <10 <10
6	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Plants Scirpus a Scirpus b Scirpus c	<20 <20 <20 <20	<pre><20 <20 <20 <20 <20 </pre>	<20 <20 <20 <20	<pre><20 <20 <20 <20 <20 </pre>	<20 <20 <20 <20	<30<30<30<30	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<20 <20 <20 <20	<20 <20 <20 <20	<pre><20 <20 <20 <20 <20 <20 </pre>

Concluded. Pesticide Concentration in Naturally-occurring Wetland Plants and Soils (Concentration in ug/kg Wet Weight) Table II-6

Site		Dieldrin	Endo- sulfan I I	Endo- sulfan II	Sulfate	Endrin	Endrin Aldehyde	Hepta- chlor	Hepta- chlor Epoxide	Met- oxy- chlor	Toxa- phene
10		<5.0	<5.0	<5.0	0.	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	Typna a Typha b Typha c Typha d	<pre></pre>	<pre></pre>	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	750 750 750 750 750	<20 <20 <20 <20		<20 <20 <20 <20	<pre></pre>	<pre></pre>	^
11	Soil Plants	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Scirpus a Scirpus b Scirpus c	\$25.0 \$25.0 \$25.0	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	\$\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\	<pre><2.0 <2.0 <2.0 <2.0 </pre>	<pre><20.0 <20.0 <20.0 <20.0 </pre>	<pre><20.0 <20.0 <20.0 <20.0 </pre>	^2.0 ^2.0 ^2.0 ^2.0	^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^	^ ^ 2 . 0 ^ 2 . 0 ^ 2 . 0 . 0	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0
13	Soil Plants Typha a Typha b	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
	Typha c Typha d Animals Corbicula	<20 16	<20	<20	<20 <	<20 18	<20	<20 42		<20	<20
14	Soil	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	
	Scirpus a Salicornia c Salicornia d	0 0 0 7 7 7 0 7 7 0 0	0 0 0 0 7 7 7 0 0 0	0 0 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<2.0 <2.0 <2.0		\$2.0 \$2.0 \$2.0	<pre><2.0 <2.0 <2.0</pre>	<pre></pre>	

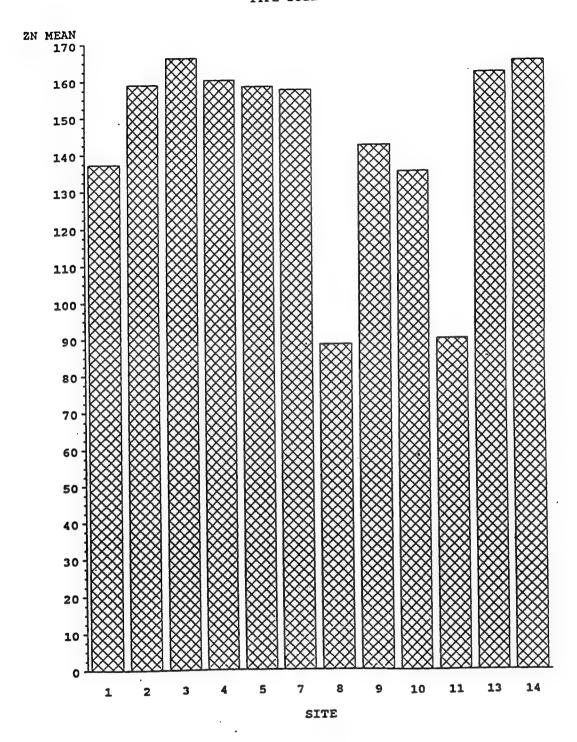


Figure II-17. Mean Zinc Concentrations in Soil from Sites 1 through 14.

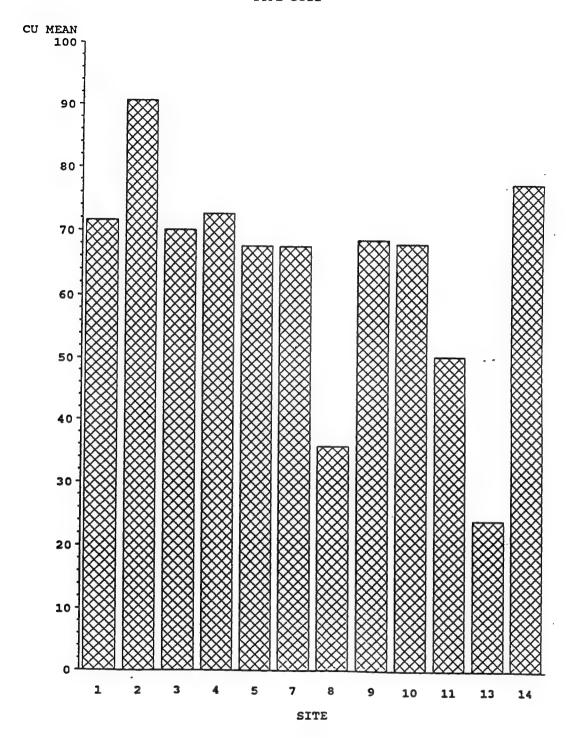


Figure II-18. Mean Copper Concentrations in Soil from Sites 1 through 14.

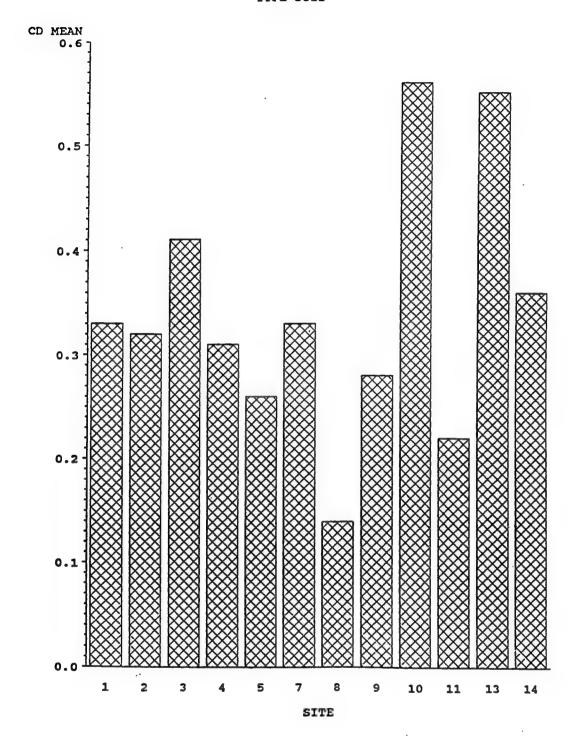


Figure II-19. Mean Cadmium Concentrations in Soil from Sites 1 through 14.

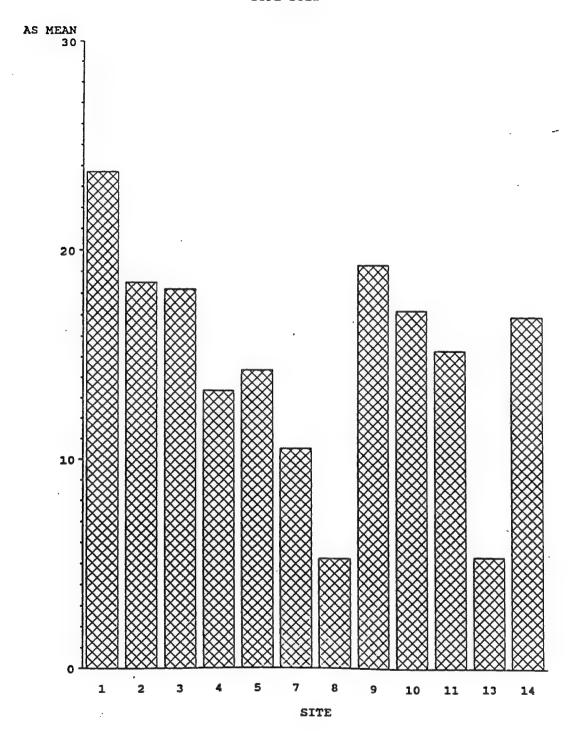


Figure II-20. Mean Arsenic Concentrations in Soil from Sites 1 through 14.

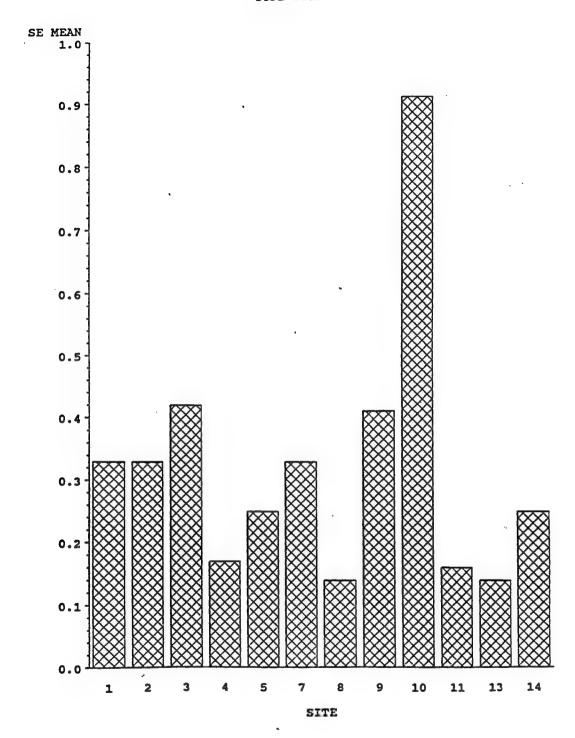


Figure II-21. Mean Selenium Concentrations in Soil from Sites 1 through 14.

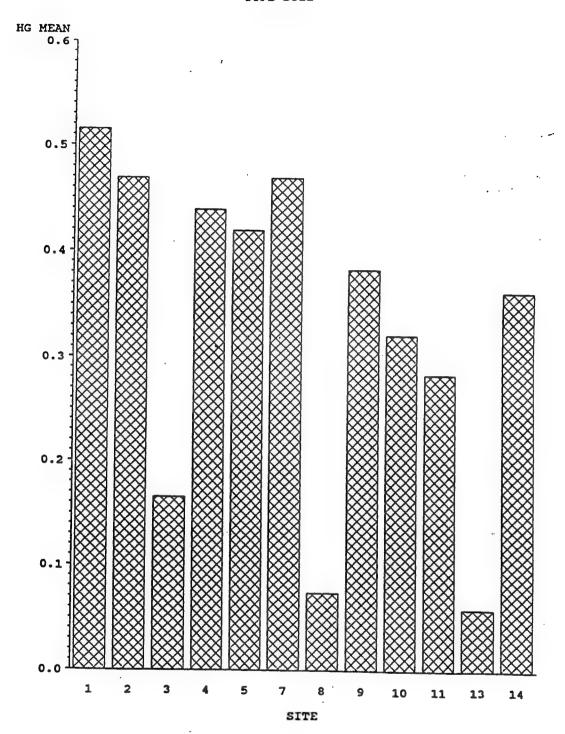


Figure II-22. Mean Mercury Concentrations in Soil from Sites 1 through 14.

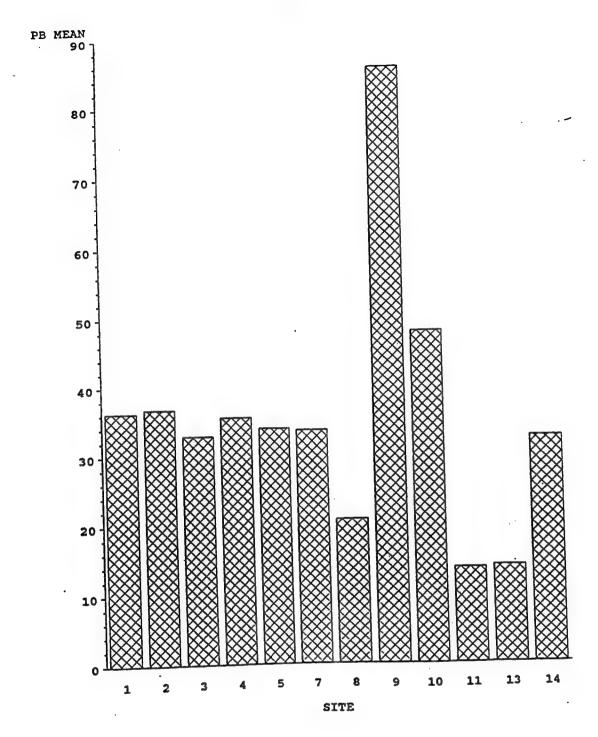


Figure II-23. Mean Lead Concentrations in Soil from Sites 1 through 14.

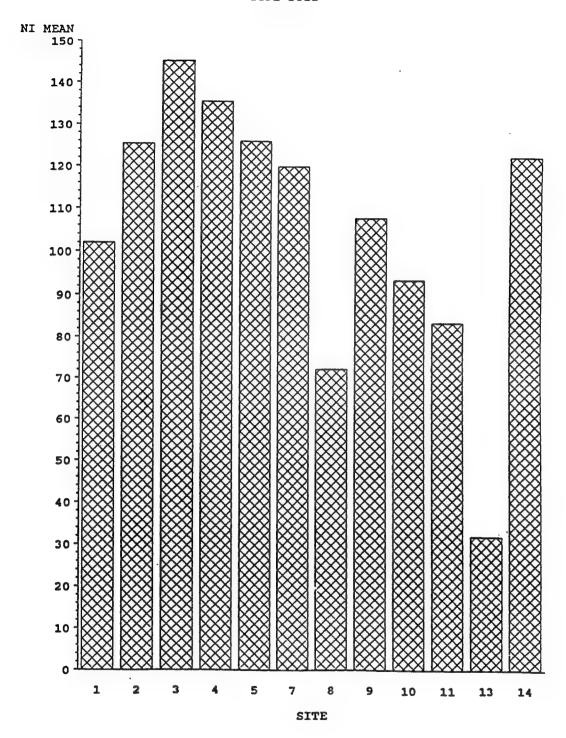


Figure II-24. Mean Nickel Concentrations in Soil from Sites 1 through 14.

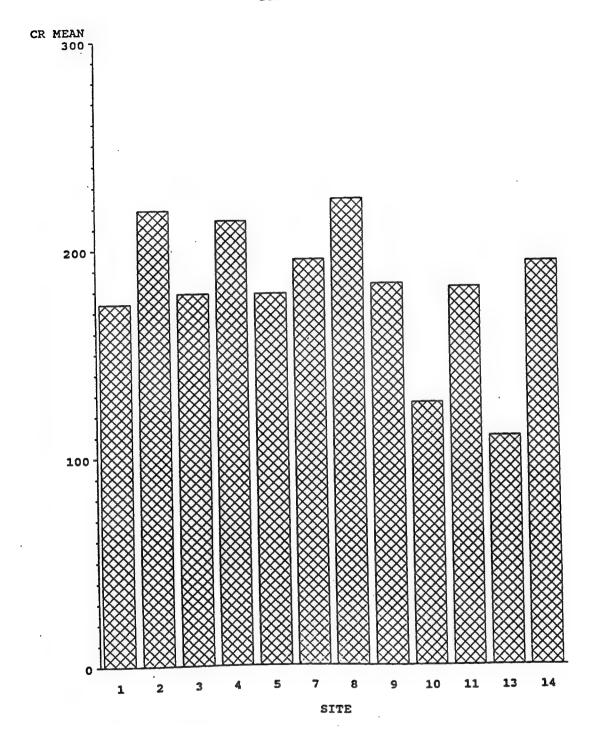


Figure II-25. Mean Chromium Concentrations in Soil from Sites 1 through 14.

MEAN OF ZN BY TYPE GROUPED BY SITE

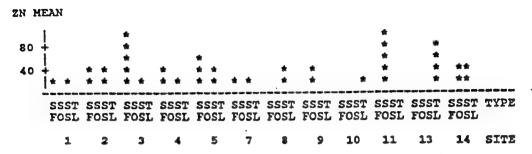


Figure II-26. Mean Zinc Concentrations of Plants, Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF CU BY TYPE GROUPED BY SITE

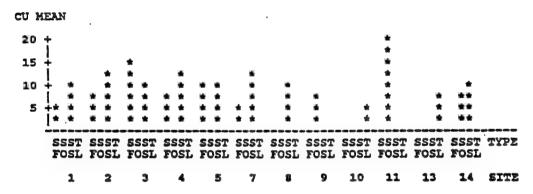


Figure II-27. Mean Copper Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF CD BY TYPE GROUPED BY SITE

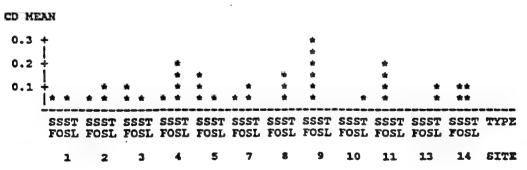


Figure II-28. Mean Cadmium Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF AS BY TYPE GROUPED BY SITE

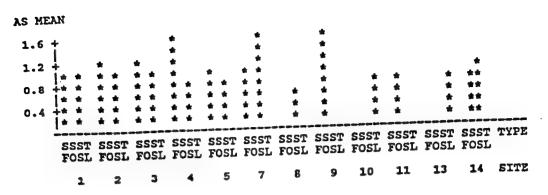


Figure II-29. Mean Arsenic Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF SE BY TYPE GROUPED BY SITE

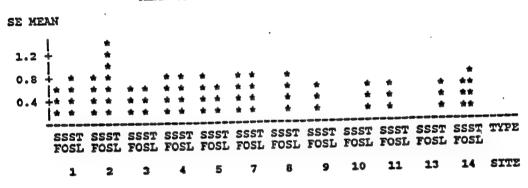


Figure II-30. Mean Selenium Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF HG BY TYPE GROUPED BY SITE

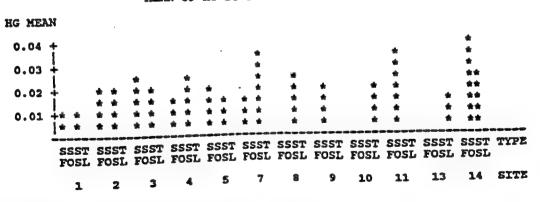


Figure II-31. Mean Mercury Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF PB BY TYPE GROUPED BY SITE

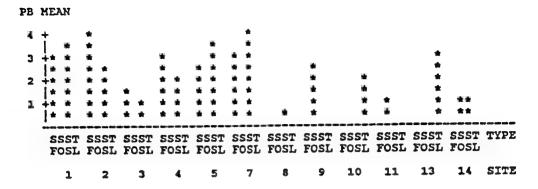


Figure II-32. Mean Lead Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF NI BY TYPE GROUPED BY SITE

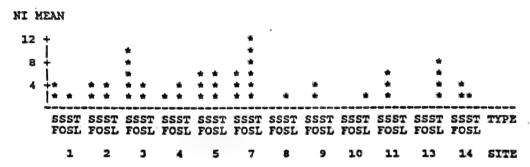


Figure II-33. Mean Nickel Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF CR BY TYPE GROUPED BY SITE

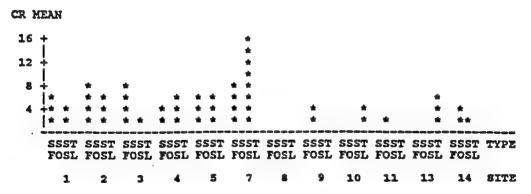


Figure II-34. Mean Chromium Concentrations of Plants Spartina (SF), Salicornia (SO), Scirpus (SS), and Typha (TL) Grouped by Site.

MEAN OF ZN BY TYPE GROUPED BY SITE

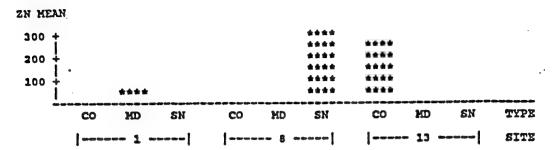


Figure II-35. Mean Zinc Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF CU BY TYPE GROUPED BY SITE

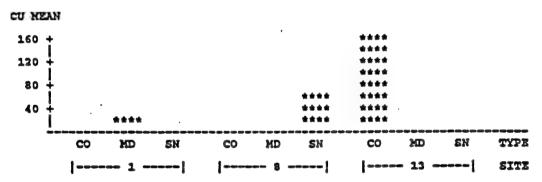


Figure II-36. Mean Copper Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF CD BY TYPE GROUPED BY SITE

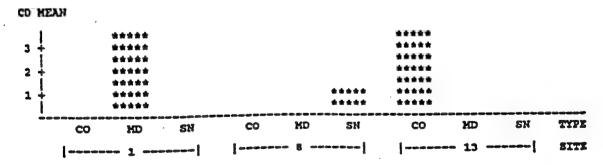


Figure II-37. Mean Chromium Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

HEAN OF AS BY TYPE GROUPED BY SITE

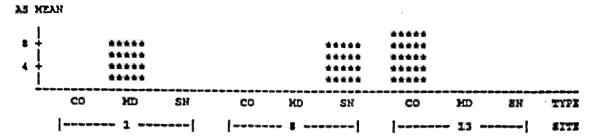


Figure II-38. Mean Arsenic Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF SE BY TYPE GROUPED BY SITE

SE MEAN 3 2 1 CO MD SN CO KD SN CO XD EN TYPE |------| |----| |------SITE

Figure II-39. Mean Selenium Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

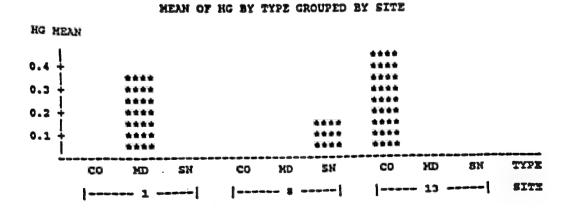


Figure II-40. Mean Mercury Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF PB BY TYPE GROUPED BY SITE

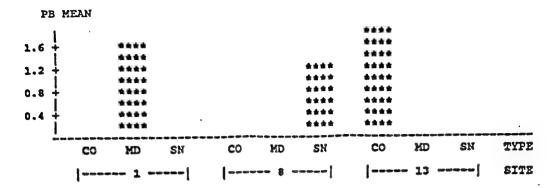


Figure II-41. Mean Lead Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF NI BY TYPE GROUPED BY SITE

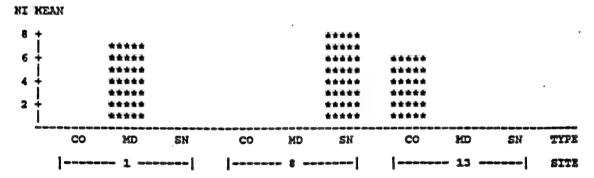


Figure II-42. Mean Nickel Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

MEAN OF CR BY TYPE GROUPED BY SITE

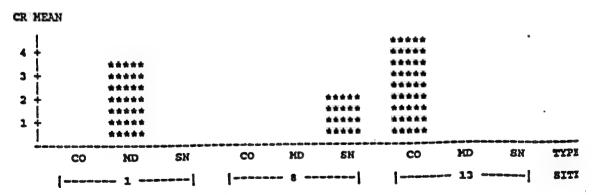


Figure II-43. Mean Chromium Concentrations of Organisms Corbicula (CO), Modiolus (MD), Nassarius (SN) Grouped by site.

Table II-7 Summary of Concentrations of Contaminants in Soils Under Field Conditions (Concentrations in mg/kg, dry-weight for metals, and ug/kg, wet-weight all others)

					eshwater es: 11 - 13
Mean	Range	Mean	Range	Mean	Range
14.87	5.29 - 23.7	18.5	16.9 - 19.3	10.3	5.3 - 15.3
197.7	174.0 - 224.0	167.5	126.0 - 193.0	145.5	110.0 - 181.0
68.6	35.9 - 90.6	71.5	67.9 - 77.3	37.3	24.2 - 50.3
120.8	72.2 - 145.2	107.4	93.3 - 122.1	57.8	32.2 - 83.3
32.9	20.9 - 36.8	62.6	32.5 - 85.6	13.9	13.7 - 14.0
0.28*	<0.14 - 0.42	0.49	0.25 - 0.91	0.15*	<0.14 - 0.16
146.67	88.5 - 166.1	146.9	135.0 - 164.7	125.8	89.8 - 161.7
0.30	0.33 - 0.41	0.37	0.28 - 0.56	0.39	0.22 - 0.55
0.364	0.074 - 0.515	0.365	0.321 - 0.394	0.171	0.059 - 0.283
1.76*	<1.2 - 2.9	1.6	<1.3 - <1.9	<0.9\$	<0.9
2.57	2.0 - 3.1	3.4	3.2 - 3.6	17.6	1.8 - 33.4
3.01*	<1.4 - 89.6	4.3"	<1.6 - 9.6	<0.9\$	<0.9 ©
3.83*	<1.3 - 17.0	3.1	2.1 - 4.7	<0.98	<0.90
<30 ^{\$}	<30●	<36.7 ^{\$}	<30 - <50	<30\$	<30 °
<30 ^s	<30 ⁶	<36.78	<30 - <50	<30 ⁸	<30 *
<30 ^{\$}	<30●	<36.7	<30 - <50	<30 ⁸	<30°
<30 ^{\$}	<30°	<36.7	<30 - <50	<30 ^{\$}	<30 [®]
<30 ^{\$}	<30 ®	<36.7 ^{\$}	<30 - <50	<30 ^{\$}	<30°
93.3 ^{\$}	<30 - 210	<36.78	<30 - <50	<30 ^s	<30 [©]
<30 ^{\$}	<30 °	<36.7 ^{\$}	<30 - <50	<30 ^{\$}	<30°
	Mean 14.87 197.7 68.6 120.8 32.9 0.28* 146.67 0.30 0.364 1.76* 2.57 3.01* 3.83* <30\$ <30\$ <30\$ <30\$ <30\$ <30\$ <30\$ <30	14.87 5.29 - 23.7 197.7 174.0 - 224.0 68.6 35.9 - 90.6 120.8 72.2 - 145.2 32.9 20.9 - 36.8 0.28" <0.14 - 0.42 146.67 88.5 - 166.1 0.30 0.33 - 0.41 0.364 0.074 - 0.515 1.76" <1.2 - 2.9 2.57 2.0 - 3.1 3.01" <1.4 - 89.6 3.83" <1.3 - 17.0 <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30° <30°	Mean Range Mean 14.87 5.29 - 23.7 18.5 197.7 174.0 - 224.0 167.5 68.6 35.9 - 90.6 71.5 120.8 72.2 - 145.2 107.4 32.9 20.9 - 36.8 62.6 0.28" <0.14 - 0.42	Sites: 1 - 8 Sites: 9, 10, and 14 Mean Range Mean Range 14.87 5.29 - 23.7 18.5 16.9 - 19.3 197.7 174.0 - 224.0 167.5 126.0 - 193.0 68.6 35.9 - 90.6 71.5 67.9 - 77.3 120.8 72.2 - 145.2 107.4 93.3 - 122.1 32.9 20.9 - 36.8 62.6 32.5 - 85.6 0.28° <0.14 - 0.42	Sites: 1 - 8 Sites: 9, 10, and 14 Sites Mean Range Mean Range Mean 14.87 5.29 - 23.7 18.5 16.9 - 19.3 10.3 197.7 174.0 - 224.0 167.5 126.0 - 193.0 145.5 68.6 35.9 - 90.6 71.5 67.9 - 77.3 37.3 120.8 72.2 - 145.2 107.4 93.3 - 122.1 57.8 32.9 20.9 - 36.8 62.6 32.5 - 85.6 13.9 0.28* <0.14 - 0.42

[:] This mean contains at least one less than value.

Every variable in this set was this same value.

s: All values were less than detection limits.

Table II-7 Continued. Summary of Concentrations of Contaminants in Soils Under Field Conditions (Concentrations in ug/kg, wet-weight basis)

			Estu	arine	Fres	hwater
	Marin Sites: 1			10, and 14	Sites:	11 - 13
PAHs	Mean	Range	Mean	Range	Mean	<u>Range</u>
Acenaph- thene	10.3	<10 - 12	13.0	<10 - 19	<10 ^s	<100
Acenaph- thylene	10.7	<10 - 15	46.7*	<10 - 120	<10 ^{\$}	<10 [®]
Anthr- acene	16.3*	<10 - 38	41.3*	<10 - 97	<10 ^{\$}	<10**
Benzo [a] Anthracene	42.4	<10 - 100	72.3	11 - 150	19.5*	<10 - 29
Benzo [b] Fluoranthene	52.6*	<10 - 96	104.0	18 - 211	14*	<10 - 18
Benzo [k] Fluoranthene	42.1	<10 - 82	76.7	13 - 150	15*	<10 - 20
Benzo [a] Pyrene	59.9*	130 - <10	69.3	16 - 130	16"	<10 - 22
Benzo [g,h,i] perylene	63.4"	<10 - 110	13.0*	<10 - 19	<10 ^{\$}	<10°
Chrysene	46.7*	<10 - 100	46.7*	<10 - 120	<10 ^{\$}	<100
Dibenzo [a,h] anthracene	12.1	<10 - 19	41.3*	<10 - 97	<10 ^s	<10°
Fluor- anthene	85.1*	<10 - 190	72.3	11 - 150	20	11 - 29
Fluorene	<10\$	<10 [©]	104.0	18 - 211	18	18*
Ideno-1,2,3- pyrene	55.1*	<10 - 99	76.7	13 - 150	16.5	13 - 20
2-Methyl- Naphthalene	22.0	<10 - 30	NA	NA	NA	NA
Naphthalene	49.1	26 - 64	69.3	16 - 130	19	16 - 22
Phenan- threne	37.4*	<10 - 94	15.0*	<10 - 20	16.5	13 - 20
Pyrene	108.9*	<10 - 240	28.0"	<10 - 46	39.5	33 - 46

<sup>This mean contains at least one less than value.
Every variable in this set was this same value.
All values were less than detection limits.
NA: Not available.</sup>

Table II-7 Concluded. Summary of Concentrations of Contaminants in Soils Under Field Conditions (Concentrations in ug/kg, wet-weight basis)

	Marin Sites: 1			uarine , 10, and 14		shwater : 11 - 13
<u>Pesticides</u>	Mean	Range	Mean	Range	Mean	Range
Aldrin	<3.0\$	<3.0°	<3.75	<3.0 - <5.0	<3.0\$	<3.0°
a-BHC	<3.0°	<3.00	<3.78	<3.0 - <5.0	<3.05	<3.0°
b-BHC	<3.0\$	<3.0€	<3.75	<3.0 - <5.0	<3.0 ^s	<3.0°
d-BHC	<3.05	<3.0●	<3.75	<3.0 - <5.0	<3.0 ^{\$}	<3.00
g-BHC	<3.0\$	<3.00	<3.75	<3.0 - <5.0	<3.0°	<3.00
Chlordane	<3.0\$	<3.0●	<3.75	<3.0 - <5.0	<3.0\$	<3.0°
1,4-DDD	<3.0\$	<3.0°	<3.75	<3.0 - <5.0	<3.0\$	<3.00
4,4-DDE	<3.05	<3.0°	<3.75	<3.0 - <5.0	<3.05	<3.0€
1,4-DDT	<3.05	<3.0°	' <3.7 ^{\$}	<3.0 - <5.0	<3.0 ^{\$}	<3.0°
Dieldrin	<3.0\$	<3.0°	<3.78	<3.0 - <5.0	<3.0 ^{\$}	<3.0°
Endosulfan I	<3.0 ^{\$}	<3.0°	<3.75	<3.0 - <5.0	<3.0\$	<3.0°
Endosulfan II	<3.0\$	<3.0°	<3.75	<3.0 - <5.0	<3.0 ^{\$}	<3.0°
Endosulfan sulfate	<3.0 ^{\$}	<3.0°	<3.7 ^{\$}	<3.0 - <5.0	<3.0 ^{\$}	<3.0°
ndrin	<3.0 ^{\$}	<3.0°	<3.75	<3.0 - <5.0	<3.0 ^{\$}	<3.0°
Indrin Aldehyde	<3.0\$	<3.0 [©]	<3.75	<3.0 - <5.0	<3.0\$	<3.0°
Meptachlor	<3.0\$	<3.0°	<3.75	<3.0 - <5.0	<3.0	<3.0°
eptachlor Epoxide	3.09*	3.6 - <3.0	<3.78	<3.0 - <5.0	<3.0\$	<3.0°
Methoxychlor	<3.0 ^{\$}	<3.0 @	<3.78	<3.0 - <5.0	<3.0 ^{\$}	<3.0 @
oxaphene	<115.68	<200 - <3.0	<4.05	<3.0 - <5.0	<3.0 ^{\$}	<3.0°

[:] This mean contains at least one less than value.
: Every variable in this set was this same value.
: All values were less than detection limits.

Table II-8 Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, dry-weight basis)

		Max	ine	Esti	narine		hwater
			s: 1 - 8), 10, and 14	Sites	:: 11 - 13
		STUCE					
		Mean	Range	Mean	Range	Mean	Range
ieta	als						
					NIX.	NA	NA
s:	Spartina	1.14	<0.86 - 1.82	NA	NA	NA	NA NA
	Salicornia	0.91	<0.003 - 2.20	<0.948	<0.92 - <0.95	0.85*	0.79 - <0.87
	Scirpus	NA	NA	<1.46 ^s	<0.71 - <4.2		
	Typha	NA	NA	<0.815	<0.77 - <0.87	<0.88	0.83 - <0.91
		6.65*	2.5 - 8.9	NA	NA	NA	NA
r:	Spartina		0.4 - 25.4	2.65	1.7 - 3.6	NA	NA
	Salicornia	4.99		4.34	3.3 - 6.4	2.33	0.7 - 4.0
	Scirpus	NA	NA		<3.4 - <4.1	5.83	<4.0 - 8.0
	Typha	NA	NA	<3.65°	<3.4 - <4.1	3.03	74.0 - 0.0
11 :	Spartina	8.05	4.35 - 13.9	NA	NA	NA	· NA
	Salicornia	10.7	6.52 - 19.1	10.75	10.1 - 11.4	NA	NA
	Scirpus	NA	NA	7.36	5.52 - 10.13	19.4	13.6 - 31.1
	Typha	NA	NA	6.14	4.06 - 10.18	6.53	4.0 - 9.41
. .	Constina	5.20	1.96 - 9.29	NA	NA	NA	NA
1:	Spartina	4.45	<0.93 - 19.20	2.82	1.85 - 3.78	NA	NA
	Salicornia			3.93	1.97 - 4.26	6.59	4.47 - 9.39
	Scirpus	NA	NA	2.41	2.16 - 2.64	5.35	4.27 - 9.40
	Typha	NA	NA	2.41	2.10 - 2.01	J	
b:	Spartina	2.81*	0.60 - 4.90	NA	NA	NA	NA
	Salicornia	2.07	0.23 - 5.40	0.85	0.71 - 0.99	NA	NA
	Scirpus	NA	NA	2.04	1.18 - 2.50	0.79	0.49 - 1.03
	Typha	NA	NA	2.05	<1.9 - 2.19	2.8	<2.1 - 4.0
		0.73	<0.63 - 0.85	NA	NA	NA	NA
e:	Spartina		<0.63 - <2.20°			NA	NA
	Salicornia			<0.61	<0.58 - <0.65	<0.615	<0.56 - <0.6
	Scirpus	NA	NA	<0.65		<0.638	<0.62 - <0.6
	Typha	NA	NA	~0.05	70.03 - 70.03	-0.00	
n:	Spartina	45.7	21.2 - 98.0	NA	NA	NA	NA NA
	Salicornia	30.6	12.04 - 57.4	30.3	29.8 - 30.8	NA	
	Scirpus	NA	NA	40.1	27.2 - 48.4	92.7	59.3 - 133
	Typha	NA	NA	19.2	17.8 - 19.0	71.9	34.3 - 98.
а.	Spartina	0.076	0.032 - 0.22	NA	NA	NA	NA
.u.i	Salicornia		0.05 - 0.29	0.12	0.07 - 0.17	NA	NA
		NA	NA	0.24	0.08 - 0.37	0.18	0.13 - 0.2
	Scirpus Troba	NA	NA NA	0.064	0.035 - 0.100	0.11	0.07 - 0.1
	Typha	MA					N/A
g:	Spartina	0.016	0.008 - 0.027	NA 0 027	NA 0.019 - 0.034	NA NA	NA NA
	Salicornia		0.01 - 0.038	0.027	0.015 ~ 0.034	0.035	
	Scirpus	NA	NA	0.024	0.012 - 0.038	0.035	
	Typha	NA	NA	0.019	0.012 - 0.026	0.014	0.010 - 0.

<sup>This mean contains at least one less than value.
Every variable in this set was this same value.
All values were less than detection limits.
NA: Not applicable. No plants of this species at this site.</sup>

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

		rine		uarine	Fre	shwater
	Site	s: 1 - 8	Sites: !	9, 10, and 14		s: 11 - 13
	Mean	Range	Mean	Range	Mean	Range
Butyltins						
Tetrabutyltin:						
<i>Spartina</i>		<2.1 - 2.7	NA	NA	NA	NA
Salicornia	6.65*	<1.6 - 54.7	2.75	<3.1 - 2.4	NA	NA
Scirpus	NA	NA	3.88	1.2 - 6.1	3.93	1.2 - 5.5
Typha	NA	NA	8.7	2.2 - 11.4		<3.2 - 18.3
Tributyltin:						
Spartina	4.82	<2.5 - 9.2	NA	NA	NA	NA
Salicornia	7.51	<1.8 - 35.8	4.6	4.4 - 4.8	_	
Scirpus	NA	NA	8.02	2.2 - 14.7	NA 4 07	NA
Typha	NA	NA.	4.13	2.2 - 14.7	4.97	2.2 - 5.6
	A143	WA.	4.13	2.2 - 5.1	5.78	<3.6 - 8.4
Dibutyltin:	2 4 7 7					
Spartina		<2.1 - 3.7	NA	NA	NA	NA
Salicornia	5.18*	<1.4 - 13.2	2.6	<3.0 - 2.2	NA	NA
Scirpus	NA	NA	3.78	<2.9 - 6.7	3.43"	1.1 - 5.6
Typha	NA	NA	3.0	2.5 - 3.7	3.45*	2.3 - 4.4
Monobutyltin:						
Spartina		<1.9 - 19.8	NA	NA	NA	NA
Salicornia	15.6	<1.3 - 64.3	20.35	5.6 - 35.1	NA	NA
Scirpus	NA	NA	4.2	<2.9 - 5.0	5.87	<3.7 - 9.5
Typha	NA	NA	7.45	<2.2 - 14.0	4.7	<3.0 - 7.0
PCBs						
Aroclor 1016						
Spartina	<73.3 ^{\$}	<20 - <100	NA	NA	NA	NA
Salicornia	<55.0°		NA	NA.	NA NA	NA NA
Scirpus	NA	NA	<100\$	<100°	<20 ^{\$}	<20°
Typha	NA	NA	<1005	<100°	<1005	<1000
roclor 1221						
	<73.3 ^s	<20 - <100	878	373		•
Salicornia	<55.0°	<20 - <100	NA NA	NA	NA	NA
Scirpus	AM	NA	<100 ⁵	NA -1009	NA	NA
Typha	NA	NA	<100°	<100°	<20 ^{\$}	<20
	anes.	na na	~100 ·	<100	<100°	<100°
roclor 1232	-73 AS	400 4000				
Spartina Salisamia	<73.3 ⁸	<20 - <100	NA	NA	NA	NA
Salicornia	<55.0 ⁸	<20 - <100	NA	NA	NA	NA
Scirpus	NA	NA	<100 ^s	<1000	<20\$	<20°
Typha	NA	NA	<100°	<100°	<100°	<100

[:] This mean contains at least one less than value.

e: Every variable in this set was this same value.

[:] All values were less than detection limits.

[:] Indicates analyte detected in the blank.

NA: Not applicable. No plants of this species at these sites.

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

	24-	mino.	Estu	arine	Fres	hwater
		rine es: 1 - 8		, 10, and 14	Sites	: 11 - 13
	0100			Danas	Mean	Range
-	Mean	Range	Mean	Range	34-1414	
PCBs						
roclor 1242				373	NA	NA
Spartina	<73.3 ^s	<20 - <100	NA	NA	NA	NA
Salicornia	<55.0 ^{\$}	<20 - <100	NA	NA	<20 ^s	<200
Scirpus	NA	NA	<100°	<1000	<100°	<1000
Typha	NА	NA	<100 ^s	<1000	<100	~100
roclor 1248					***	NA
Spartina	<73.3 ^s	<20 - <100	NA	NA	NA	
Salicornia	<60 ^s	<20 - <100	NA	NA	NA	NA <20 €
Scirpus	NA	NA	<100 ^s	<100°	<20°	
Typha	NA	NA	<100 ^s	<1000	<100 ^s	<1000
Aroclor 1254					57 R	NA
Spartina	<73.3 ^s	<20 - <100	NA	NA	AM	
Salicornia	<60 ^s	<20 - <100	NA	NA	NA	NA
Scirpus	NA	NA	,<100°	<1000	<20 ^s	<200
Typha	NA	NA	<100 ^s	<1000	<100 ^s	<100°
roclor 1260					•••	***
Spartina	<73.3 ^s	<20 - <100	NA	NA	NA	NA
Salicornia	<60 ^s	<20 - <100	NA	NA	NA	NA
Scirpus	NA	NA	<100 ^s	<100	<20 ⁵	<200
Typha	NA	NA	<100 ^s	<100°	<100 ^{\$}	<100°
PAHS						
Acenaphthene			57X	Ma	NA	NA
<i>Spartina</i>	<10 ^s	<100	NA 105	NA <10 [©]	NA	NA
Salicornia	<10 ^s	<10	<10 ⁵	<10°	<10°	<100
Scirpus	NA	NA	<10 ⁵		<10 ⁵	<100
Typha	NA	NA	<10 ^s	<10°	~10	-20
Acenaph-						
thylene		-1.00	WX	NA	NA	NA
Spartina	<105	<100	NA <10 ⁵	<10 [®]	NA	NA
Salicornia	<10 ^s	<100	<10 ⁵	<10°	<105	<100
Scirpus	NA	NA	<10 ⁵	<10°	<10 ⁵	<100
Typha	NA	NA	<10,	~10 -	~~~	
Anthracene		410 26	NA	NA	NA	NA
Spartina	11.3	<10 - 26	<10 ^{\$}	<100	NA	NA
Salicornia	<10\$	<10	<10 ⁵	<10°	<10 ⁵	<100
Scirpus	NA	NA	<10,	<100	<10 ⁵	<100
Typha	NA	NA	<10\$	Z10-	~10	

[:] This mean contains at least one less than value.

• : Every variable in this set was this same value.

[:] All values were less than detection limits.

NA: Not applicable. No plants of this species at these sites.

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

		rine		arine		hwater
	Sites	s: 1 - 8	Sites: S), 10, and 14	Sites	: 11 - 13
	Mean	Range	Mean	Range	Mean	Range
PAHS						
Benzo [a]						
Anthracene						
Spartina	<10 ^s	<100	NA	NA	NA	NA
Salicornia	<10\$	<100	<10 ^s	<10	NA	NA
Scirpus	NA	NA	<10 ^s	<100	<105	<100
Typha	NA	NA	<10\$	<100	<10 ^s	<100
Benzo [b]						
Fluoranthene						
Spartina	<10 ⁵	<10	NA	NA	NA	NA
Salicornia	<10\$	<10°	<105	<100	NA	NA
Scirpus	NA	NA	<10\$	<100	<105	<100
Typha	NA	NA	<10 ^s	<10*	<105	<100
Benzo [b] Fluoranthene						
Spartina	<105	<10 [®]	NA	NA	NA	NA
Salicornia	<105	<10	<10 ⁵	<100	NA	NA NA
Scirpus	NA	NA	<105	<100	<10 ^s	<10 [©]
Typha	NA	NA	<10 ^s	<100	<10°	<10°
Benzo [k] Fluoranthene						
Spartina	<10 ^s	<10 [®]	NA	NA	NA	NA
Salicornia	<10 ^s	<10	<10 ^s	<100	NA	NA.
Scirpus	NA	NA	<103	<100	<10 ^s	<100
Typha	NA	NA	<10 ^s	<100	<105	<100
enzo [a] Pyrene						
Spartina	<10\$	<10°	NA	NA	NA	377
Salicornia	<10\$	<10	<10 ⁸	<10 °	NA NA	NA
Scirpus	NA	NA	<105	<100	<10 ⁵	NA <10 [©]
Typha	NA	NA	<10\$	<10	<10 ⁵	<100
enzo [g,h,i]						
perylene						
Spartina	<105	<10 ⁴	NA	NA	NA	NA
Salicornia	<10\$	<10	<10 ^s	<10	NA	NA
Scirpus	NA	NA	<10 ^s	<10●	<10 ^s	<100
Typha	NA	NA	<108	<100	<10 ^s	<100
hrysene	•					
Spartina	<10 ^s	<10	NA	NA	NA	NA
Salicornia	<10\$	<10	<10 ^s	<10°	NA	NA
Scirpus	NA	NA	<10\$	<10	<10 ^s	<10
Typha	NA	NA	<105	<10	<10 ^s	<100

[:] This mean contains at least one less than value.

Every variable in this set was this same value.

s: All values were less than detection limits.

NA: Not applicable/Not available. No plants of this species at these sites.

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

	360	-ina	Estu	arine		water
		rine s: 1 - 8		, 10, and 14	Sites:	11 - 13
	Site	s: 1 = 0 	52000.			2
	Mean	Range	Mean	Range	Mean	Range
Dibenzo [a,h]						
anthracene				***	NA	NA
Spartina	<10 ^s	<10 [®]	NA	NA	NA	NA
Salicornia	<10 ^{\$}	<100	<10 ^s	<100	<10 ^s	<100
Scirpus	NA	NA	<105	<100		
Typha	NA	NA	<10 ^{\$}	<100	<10 ^{\$}	<10*
Fluoranthene					wx	NA
Spartina	<10 ^s	<10 ⁶	NA	NA	NA	
Salicornia	10.06	<10 - 11	<10 ^s	<100	NA	NA
Scirpus	NA	NA	<10 ^s	<10°	<105	<100
Typha	NA	AA	<10 ^{\$}	<100	<10 ^{\$}	<10
Fluorene						N***
Spartina	10.42	<10 - 15	NA	NA	NA	NA
Salicornia	10.06	<10 - 11	<10 ^s	<100	NA	NA
Scirpus	NA	NA	<10 ^s	<100	<10 ^s	<100
	NA	NA	<10 ^s	<100	<10 ^s	<100
Typha		MA				
Indeno-1,2,3	-					
pyrene	<10\$	<100	NA	NA	NA	NA
Spartina	<10 ^s	<100	<105	<10 [®]	NA	NA
Salicornia		NA NA	<10 ^s	<100	<10 ^s	<10
Scirpus	NA	NA NA	<10 ⁵	<100	<10 ^s	<10°
Typha	NA	MA		- 		
2-Methyl-						
Naphthalene	24.83*	<20 - 32	NA	NA	NA	NA
Spartina		<20 - 32	NA	NA	NA	NA
Salicornia	24.31		NA NA	NA.	NA	NA
Scirpus	NA	NA	NA NA	NA NA	NA	NA
Typha	NA	NA	INEX.	81678	***-	
Naphthalene	56 13*	28 - 88	NA	NA	NA	NA
Spartina			<10 ⁵	<100	NA	NA
Salicornia		16 - 98	<10 ⁵	<100	<10 ^s	<100
Scirpus	NA	NA	<10 ^s	<100	<105	<100
Typha	NA	NA	~10	~40		-
Phenanthrene	20.5*	<10 31	NA	NA	NA	NA
Spartina	20.5	<10 - 31	<10 ⁵	<100	NA	NA
Salicornia		<10 - 37		<10 - 18	15	10 - 18
Scirpus		NA	14.8*	<10 - 18	12.5*	<10 - 18
Typha	NA	NA	12.75	<10 - 20	16.3	
Pyrene			57%	NA	NA	NA
Spartina	10.17	<10 - 12	NA 1108	<10°	NA	NA
Salicornia	10.13*	<10 - 12	<10 ^s		<10 ⁵	<100
Scirpus	NA	NA	<10 ⁵	<10° <10°	<10 ⁵	<10
much a	NA	NA ins at least o	<10 ^{\$}		/10	710

^{*:} This mean contains at least one less than value.

* Every variable in this set was this same value.

* All values were less than detection limits. NA: Not applicable.

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

		Marine ces: 1 - 8		arine , 10, and 14		hwater : 11 - 13
Pesticides	<u>Mean</u>	Range	Mean	Range	Mean	Range
Aldrin: Spartina	<14 ^{\$}	<2.0 - <20	NA	NA	NA	NA
Salicornia	<11 ⁵	<2.0 - <20	<2.0 ^s	<2.0°	NA	NA.
Scirpus	NA	NA	<2.0 ⁵	<2.0	<2.0°	<2.00
_	NA	NA NA	<20	<20	<20 ^s	<20
Typha	MA	NA	~20	~20	~20	\20 °
a-BHC:						
Spartina		<2.0 - <20	NA	NA	NA	NA
Salicornia	11.02	<2.0" - 2.3	<2.0 ^s	<2.0°	NA	NA
Scirpus	NA	NA	<2.0\$	<2.0 ^e	<2.0 ^s	<2.0°
Typha	NA	NA	<20	<20	<20 ^{\$}	<20°
b-BHC:						
Spartina	<14\$	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ^s	<2.00	NA	NA
Scirpus	NA	NA	<2.0 ^s	<2.0	<2.0°	<2.0
Typha	NA	NA	<20	<20	<20 ^s	<20
-22	-10.0					
i-BHC:						
Spartina		<2.0 - <20	NA	NA	NA	NA
Salicornia	<11\$	<2.0 - <20	<2.05	<2.00	NA	NA
Scirpus	NA	NA	<2.0 ³	<2.0	<2.0°	<2.0
Typha	NA	NA	<20	<20	<20 ^{\$}	<20
g-BHC:						
Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0*	<2.0°	NA	NA
Scirpus	NA	NA	<2.05	<2.0	<2.05	<2.0°
Typha	NA	NA	<20	<20	<20 ^s	<20°
Chlordane:						
Spartina	<20.75	<2.0 - <30	NA	NA	NA	NA
Salicornia	<165	<2.0 - <30	<2.05	<2.0°	NA	NA.
Scirpus	NA	NA	<2.05	<2.0	<2.0 ^s	<2.0°
Typha	NA	NA	<20	<20	<20\$	<20
4.4-DDD:						
Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ^s	<2.0°	NA NA	NA NA
Scirpus	NA	NA NA	<2.0°	<2.0	<2.0 ^{\$}	<2.0°
Typha	NA	NA.	<20	<20	<20 ⁵	<2.0°
Typue	NA	NA.	~20	~& V	~20	~20-
4,4-DDE:						
Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ^s	<2.0°	NA	NA
Scirpus	NA	NA	<2.0 ^{\$}	<2.0°	<2.08	<2.0
Typha	NA	NA	<20	<20	<20 ^{\$}	<20

[:] This mean contains at least one less than value.

[:] Every variable in this set was this same value.

s: All values were less than detection limits.

^{*:} There was a less than value much higher than this highest actual NA: Not applicable/Not available. No plants of this species in these sites.

Table II-8 Continued. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

		larine	Estua	arine , 10, and 14		water 11 - 13
	Sit	es: 1 - 8	Sites: 9	, 10, and 14	02000	
	Mean	Range	Mean	Range	Mean	Range
<u>Pesticides</u>		-				
1,4-DDT:	•		NA	NA	NA	NA
Spartina		<2.0 - <20	<2.0 ^{\$}	<2.00	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ⁵	<2.00	<2.05	<2.0°
Scirpus	NA	NA		<20	<20°	<20°
Typha	NA	NA	<20	\20	420	
Dieldrin:	. •		373	NA	NA	NA
Spartina	<14 ^s	<2.0 - <20	NA <2.0 ^s	<2.00	NA	NA
Salicornia	<115	<2.0 - <20	<2.0°	<2.0	<2.0°	<2.00
Scirpus	NA	NA		<20	<20°	<20°
Typha	NA	NA	<20	~20	-20	
Endosulfan I:		-20 -20	NA	NA	NA	NA
Spartina	<145	<2.0 - <20	<2.0°	<2.00	NA	NA
Salicornia	11.02	<2.0" - 2.3	<2.0 ⁵	<2.0	<2.0°	<2.00
Scirpus	NA	NA		<20	<20 ^s	<20°
Typha	NA	NA	<20	~20	744	
Endosulfan I	:s	<2.0 - <20	NA	NA	NA	NA
Spartina	<145	<2.0 - <20	<2.0 ^{\$}	<2.00	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ^s	<2.00	<2.0 ⁵	<2.0°
Scirpus	NA	NA	<20	<20	<20 ^s	<20°
Typha	NA	NA	~20	~ ~ •		
Endosulfan						
sulfate Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Spartina Salicornia	<115	<2.0 - <20	<2.0 ^{\$}	<2.0°	NA	NA
Scirpus	NA	NA	<2.05	<2.00	<2.0 ⁸	<2.0
Typha	NA	NA	<20	<20	_ <20 ^{\$}	<20 [©]
Endrin:					NA	NA
Spartina		<2.0 - <20	NA	NA 10		NA.
Salicornia	<115	<2.0 - <20	<2.05	<2.00	NA <2.0 ^s	<2.0°
Scirpus	NA	NA	<2.08	<2.00	<2.0°	<20°
Typha	NA	NA	<20	<20	<20	~20
Endrin						
Aldehyde:		40.0 400	NA	NA	NA	NA
Spartina		<2.0 - <20	<2.0 ^s	<2.0°	NA	NA
Salicornia	<115		<2.0°	<2.00	<2.0 ^s	<2.00
Scirpus	NA	NA	<20	<20	<20 ^s	<200
Typha	NA	NA	~20	720	-20	

^{•:} Every variable in this set was this same value.

•: All values were less than detection limits.

NA: Not applicable/Not available. No plants of this species at these sites.

Table II-8 Concluded. Summary of Concentrations of Contaminants in Plants Under Field Conditions (Concentrations in ug/kg, wet-weight)

	- 1	Marine		arine	Fres	hwater
	Si	tes: 1 - 8	Sites: 9	, 10, and 14	Sites	: 11 - 13
Pesticide	Mea:	n Range	Mean	Range	Mean	Range
Reptachlor:						
Spartina	<14 ⁸		NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ⁵	<2.0°	NA	NA
Scirpus	NA	NA	<2.0 ^s	<2.0 [®]	<2.0 ^{\$}	<2.0°
Typha	NA	NA	<20	<20	<20 ^s	<20°
Teptachlor Epoxide	:					
Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0 ^s	<2.0°	NA	NA
Scirpus	NA	NA	<2.0 ^{\$}	<2.0°	<2.0 ^{\$}	<2.0°
Typha	NA	NA	<20	<20	<20 ^s	<20°
Methoxychlo	r:					
Spartina	<145	<2.0 - <20	NA	NA	NA	NA
Salicornia	<115	<2.0 - <20	<2.0\$	<2.0 [©]	NA	NA
Scirpus	NA	NA	<2.0°	<2.0°	<2.0 ^s	<2.0°
Typha	NA	NA	<20	<20	<20 ^{\$}	<20 [©]
oxaphene:						
Spartina		<2.0 - <200	NA	NA	NA	NA
alicornia	<80.75 ^{\$}	<2.0 - <200	NA	NA	NA	NA
Scirpus	NA	NA	<2.0 ⁵	<2.00	<2.0°	<2 . 0 [©]
Typha	NA	NA	<20	<20	<20 ^s	<20°

[:] This mean contains at least one less than value.

^{• :} Every variable in this set was this same value.

[:] All values were less than detection limits.

[:] In this range there was a less than value much higher than this highest actua value.

NA: Not applicable/Not available. No plants of this species at these sites.

Table II-9 Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in mg/kg metals and ug/kg butyltins)

	3400	ei no	Estu	arine		hwater
		rine s: 1 - 8	Sites: 9	, 10, and 14	Sites	: 11 - 13
	Site	3: 1 = 0				
	Mean	Range	Mean	Range	Mean	Range
etals	110411					
etals					***	NY N
s: Modiolus	8.85	8.76 - 8.93	NA	NA	NA	NA
Cerithidea	7.78	2.5 - 11.62	NA	NA	NA	NA
Cerithidea	NA	NA	NA	NA	10.79	10.79°
Corbicula	MA					
20 - 22 - 1 - 2	3.65	3.3 - 4.0	NA	NA	NA	NA
r: Modiolus		1.2 - 2.2	NA	NA	NA	NA
Cerithidea	1.83	NA	NA	NA	4.3	4.30
Corbicula	NA	NA	••••			
		20 5 22 3	NA	NA	NA	NA
u: Modiolus	21.85	20.5 - 23.1	NA	NA	NA	NA
Cerithidea	63.8	23.5 - 93.6	NA NA	NA	164.1	164.1°
Corbicula	NA	NA	МА	IVA		
			***	NA	NA	NA
i: Modiolus	6.54	5.33 - 7.74	NA		NA	NA
Cerithidea	7.73	4.5 - 10.2	NA	NA	5.78	5.78
Corbicula	NA	NA	NA	NA	3.70	J
				***	NA	NA
b: Modiolus	1.55	1.39 - 1.71	` NA	NA		NA
Cerithidea	1.22	0.82 - 1.43	NA	NA	NA	1.89
Corbicula	NA	NA	NA	NA	1.89	1.09
CO1210111						***
e: Modiolus	3.86	3.52 - 4.19	NA	NA	NA	NA
Cerithidea	1.28	1.04 - 1.47	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	3.98	3.980
COLDIGUIA	nn	2422				
	71.4	71.1 - 71.7	NA	NA	NA	NA
n: Modiolus		131.4 - 309	NA	NA	NA	NA
Cerithidea	280.5	NA	NA	NA	273.0	273.0°
Corbicula	NA	NA	****	*		
		3.45 - 3.53	NA	NA	NA	NA
d: Modiolus	3.49		NA	NA	NA	NA
Cerithidea	0.80	0.34 - 1.03	NA.	NA	3.34	3.34°
Corbicula	NA	NA	NA	****	3.5	
			NA	NA.	NA	NA
ig: Modiolus	0.351	0.304 - 0.398		NA NA	NA	NA
Cerithidea	0.136	0.055 - 0.180	NA	NA NA	0.469	0.469
Corbicula	NA	NA	NA	NA	91300	
Butyltins						
retrabutyltin	_			WX	NA	NA
Hodiolus	<4.45 ^s	<3.9 - <5.0	NA	NA	NA.	NA
Cerithidea	<1.00	<0.6 - <1.4	NA	NA		14.6°
Corbicula	NA	NA	NA	NA	14.6	74.0-
rributyltin						118
Modiolus	36.6	34.9 - 38.3	NA	NA	NA	NA
Cerithidea	2.2	1.4 - 3.5	NA	NA	NA	NA AO 76
	NA	NA	NA	NA	40.7	40.70
Corbicula	III.	2-2-4				

[:] Dry-weight basis for metals; wet-weight for butyltins.

[:] Dry-weight basis for metals; wet-weight for batyleins.

• : Every variable in this set was this same value.

• : All values were less than detection limits.

NA : Not applicable/Not available. No animals of this species at this site.

Note : There were no animals analyzed from the estuarine sites.

Table II-9 Continued. Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in ug/kg, wet-weight)

		arine		arine , 10, and 14		hwater : 11 - 13
	Sit	es: 1 - 8	Sites: 9	, 10, and 14	Sites	: 11 - 13
	Mean	Range	Mean	Range	Mean	Range
Butyltins						
Dibutyltin						
Modiolus	7.15	<5.0 - 9.3	NA	NA	NA	NA
Cerithidea	2.55	0.9 - 4.2	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	30.1	30.1
Monobutyltin						
Modiolus	6.2	<4.6 - 7.8	NA	NA	NA	NA
Cerithidea	1.65	1.6 - 1.7	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	11.8	11.8
PCBs						
Aroclor 1016						
Modiolus	<100 ^s	<1000	NA	NA	NA	NA
Cerithidea	<100°	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100 ⁸	<1000
Aroclor 1221						
Modiolus	<100°	<1000	NA.	NA	NA	NA
Cerithidea	<100°	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100\$	<1000
Aroclor 1232						
Modiolus	<100°	<100	NA	NA	NA	NA
Cerithidea	<100°	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100°	<100
roclor 1242						
Modiolus	<100°	<100	NA	NA	NA	NA
Cerithidea	<100°	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100°	<100 ©
roclor 1248	•					
Modiolus	<100°	<100°	NA	NA	NA	NA
Cerithidea	<100°	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100 ⁵	<100°
Aroclor 1254						
Modiolus	<100 ^s	<100°	NA	NA	NA	NA
Cerithidea	<100°	<100	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100°	<100°
roclor 1260		_				
Modiolus	<100 ^s	<100 °	NA	NA	NA	NA
Cerithidea	<100	<100°	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<100 ^{\$}	<100°

Note - there were no animals analyzed from the estuarine sites.

[:] This mean contains at least one less than value.

[:] Every variable in this set was this same value.

S : All values were less than detection limits.

NA : Not applicable/Not available. No animals of this species at this site.

Table II-9 Continued. Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in ug/kg, wet-weight)

	Ma	rine s: 1 - 8	Estu Sites: 9	arine , 10, and 14	Fresi Sites	water: 11 - 13
	2116			Range	Mean	Range
	Mean	Range	Mean	Kange		
PAHS						
Cenaphthene	<10 ^s	<10 [©]	NA	NA	NA	NA
Modiolus		<100	NA	NA	NA	NA
Cerithidea	<10 ^s		NA	NA	<10 ^s	<100
Corbicula	NA	NA				
Acenaphthylene	- •		NA	NA	NA	NA
Modiolus	<10 ^s	<100	-	NA	NA	NA
Cerithidea	<10 ^{\$}	<100	NA	NA	<10 ^s	<100
Corbicula	NA	NA	NA	NO.		-
Anthracene	_		***	NA	NA	NA
Modiolus	<10 ^s	<100	NA		NA	NA
Cerithidea	<10 ^s	<100	NA	NA	<10 ^s	<100
Corbicula	NA	NA	NA	NA	-70	
Benzo [a]			•			
Anthracene		_	473	NA	NA	NA
Modiolus	<10 ^{\$}	<100	NA	NA NA	NA	NA
Cerithidea	<10 ^s	<10 [©]	NA		<10 ^s	<100
Corbicula	NA	NA	NA	NA	-10	
Benzo [b]						
Fluoranthene	3		NA	NA	NA	NA
Modiolus	<10 ^s	<100	NA NA	NA	NA	NA.
Cerithidea	<10 ^{\$}	<10°		NA.	<10 ^s	<10°
Corbicula	NA	NA	NA	NA		
Benzo [k]						
Fluoranthen	20.05	-100	NA	NA.	NA	NA
Modiolus	<10°	<100	NA NA	NA	NA	NA
Cerithidea	<10\$	<100	NA.	NA	<105	<10 °
Corbicula	NA	NA	NA	ALEX	123	
Benzo [a]						
Pyrene	•	-1.00	NA	NA	NA	NA
Modiolus	<10 ^s	<10	NA NA	NA	NA	NA
Cerithidea	<10 ^s	<10 [©]		NA NA	<105	<100
Corbicula	NA	NA	NA	MA		
Benzo [g,h,i]						
Perylene		<100	NA	NA	NA	NA
Modiolus	<10 ^s		NА	NA	NA	NA
Cerithidea	<10\$	<100	NA NA	NA	<10\$	<100
Corbicula	NA	NA	IA.	244.5		

[:] Note; there were no animals analyzed from the estuarine sites.

[:] This mean contains at least one less than value.

e: Every variable in this set was this same value.

S: All values were less than detection limits.

NA: Not applicable/Not available. No animals of this species at this site.

Table II-9 Continued. Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in ug/kg, wet-weight)

		rine	Estua			nwater : 11 - 13
	Site	s: 1 - 8	Sites: 9,	10, and 14	21168	1-
PAHs	Mean	Range	Mean	Range	Mean	Range
hrysene						27.70
Modiolus	<10\$	<10°	NA	NA	NA	NA
Cerithidea	10.5	<10 - 11	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10\$	<10
ibenzo [a,h]						
Anthracene					NA	NA
<u>Modiolus</u>	<10 ^{\$}	<100	NA	NA		NA
Cerithidea	<10 ^s	<10°	NA	NA	NA	<10°
Corbicula	NA	NA	NA	NA	<10 ^s	<100
luoranthene					***	NW
Modiolus	<105	<100	NA	NA	NA	NA
Cerithidea	<10 ^{\$}	<10 [®]	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ^s	<100
fluorene					***	£2.4
Modiolus	<105	<10°	NA	NA	NA	NA
Cerithidea	<105	<100	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ⁵	<100
Indeno-1,2,3-						
pyrene	_			***	KYX:	NA
Modiolus	<10 ⁵	<10°	NA	NA	NA	
Cerithidea	<105	<100	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ^{\$}	<100
2-Methyl-						
Naphthalene				***	NA	NA
Modiolus	37.5	<30 - 45	NA	NA	•	NA
Cerithidea	<30\$	<30°	NA	NA	NA	
Corbicula	NA	NA	NA	NA	NA	NA
Naphthalene			***	MX.	NA	NA
Modiolus	90.5	61 - 120	NA	NA	NA.	NA
Cerithidea	<60 ^s	<60°	NA	NA	<10 ⁵	<10
Corbicula	NA	NA	NA	NA	<10.	~10
Phenanthrene			57%	NA	NA	NA
M odiolus	25.5	14 - 37	NA		NA.	NA
Cerithidea	<10 ^{\$}	<10 ⁶	NA	NA	<10 ⁵	<10°
Corbicula	NA	NA	NA	NA	~10 .	-10
Pyrene	- 0*	~10 2£	NA	NA	NA	NA
Modiolus	18"	<10 - 26		NA NA	NA	NA
Cerithidea	<105	<10	NA		<10 ^s	<10
Corbicula	NA	NA	NA	NA NA	<10 ⁵	<10°
Corbicula	NA	NA	NA	NA m the estuarine		710

[:] This mean contains at least one less than value.
: Every variable in this set was this same value.

Every variable in this set was this:

All values were less than detection limits.

No animals of NA: Not applicable/Not available. No animals of this species at this site.

Table II-9 Continued. Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in ug/kg, wet-weight)

	1/2:	rine	Estu	arine	Fres	hwater
		s: 1 - 8	Sites: 9	, 10, and 14	Sites	: 11 - 13
			Mean	Range	Mean	Range
esticides	Mean	Range	Mean	<u> </u>		
ldrin	20.05	<100	NA	NA	NA	NA
Modiolus	<10 ^s		NA	NA	NA	NA
erithidea:	<105	<100	NA	NA	<10 ^s	<100
Corbicula	NA	NA	NA	MA		
-BHC			NA	NA	NA	NA
Modiolus	<10 ⁵	<100		NA	NA	NA
Cerithidea	<10 ^s	<100	NA	NA	<10 ^s	<10°
Corbicula	NA	NA	NA	NA		
-BEC			272	NA	NA	NA
Modiolus	<105	<100	NA	NA NA	NA	NA
Cerithidea	<10\$	<100	NA		<12 ^s	<120
Corbicula	NA	NA	NA	NA	716	-
I-BHC				NTS.	NA	NA
Modiolus	<10 ^{\$}	<100	NA	NA	NA NA	NA
Cerithidea	<105	<10°	. NA	NA	<24 ^s	<24
Corbicula	NA	NA	NA	NA	<24	~24
-BHC		_			NA	NA
Modiolus	<10 ^{\$}	<100	NA	NA	NA.	NA
erithidea	<10 ^{\$}	<100	NA	NA	<10 ⁵	<100
Corbicula	NA	NA	NA	NA	<10	~20
Chlordane				MA	NA	NA
Modiolus	<10 ^s	<100	NA	NA	NA	NA
Cerithidea	<10 ^s	<10 ⁶	NA	NA	<10 ^s	<10
Corbicula	NA	NA	NA .	NA	~10	
4,4-DDD			***	NA	NA	NA
Modiolus	<10 ^s	<10	NA		NA	NA
Cerithidea	<10 ^s	<100	NA	NA	<10 ⁵	<100
Corbicula	NA	NA	NA	NA	~10	
4,4-DDE	_		404	NA	NA	NA
Modiolus	<10 ^s	<100	NA		NA	NA
Cerithidea	<10 ⁵	<100	NA	NA NA	<115°	<115°
Corbicula	NA	NA	NA	NA	7444	
4,4-DDT		-4 CA	277	NA	NA	NA
Modiolus	<10 ^s	<100	NA	NA NA	NA	NA
Cerithidea	<10\$	<100	· NA		<30 ^s	<30°
Corbicula	NA	NA	NA	NA	~50	
Dieldrin	•		972	AA	NA	NA
Modiolus	<10 ^s	<100	NA		NA	NA
Cerithidea	<10 ^{\$}	<10°	NA	NA	<16 ^s	<160
	NA	NA	NA_	NA om the estuarir		

[:] Note; there were no animals analyzed from the estuarine sites.

Every variable in this set was this same value.

1. All values were less than detection limits.

NA: Not applicable/Not available. No animals of this species at this site.

Table II-9 Concluded. Summary of Concentrations of Contaminants in Animals Under Field Conditions (Concentrations in ug/kg wet-weight)

	Max	rine	Estu	arine	Fres	hwater
		s: 1 - 8	Sites: 9	, 10, and 14	Sites	: 11 - 13
	Mean	Range	Mean	Range	Mean	Range
Pesticides						
Endosulfan I		_				
Modiolus	<10 ^s	<100	NA	NA	NA	NA
Cerithidea	<10\$	<100	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ^{\$}	<10°
Endosulfan I						
Modiolus	<10\$	<10 ®	NA	NA	NA	NA
Cerithidea	<10 ^{\$}	<10 [©]	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<105	<10
Endosulfan						
Sulfate						
Modiolus	<10\$	<10	NA	NA	NA	NA
Cerithidea	<10 ^s	<10*	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ^{\$}	<100
Endrin			•			
Modiolus	<10 ^s	<10	NA	NA	NA	NA
Cerithidea	<10 ^{\$}	<10	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	18 ^{\$}	184
Endrin Aldeh	yde					
M odiolus	<10 ^s	<10	NA	NA	NA	NA
Cerithidea	<10 ^s	<100	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<105	<100
Reptachlor		_				
Modiolus	<10 ^s	<10	NA	NA	NA	NA
Cerithidea	<10\$	<10	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	425	420
Reptachlor						
Epoxide		44.08		***	***	51%
Modiolus	<10 ^s	<10	NA	NA	NA	NA
Cerithidea	<10\$	<10	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<105	<10
Methoxychlor						***
Modiolus	<10°	<10	NA	NA	NA	NA
Cerithidea	<10 ^{\$}	<10	NA	NA	NA	NA
Corbicula	NA	NA	NA	NA	<10 ^{\$}	<10
Ioxaphene	.eeet	-500	400	475	272	272
Modiolus	<500 ^{\$}	<500°	NA	NA	NA	NA
Cerithidea	<10 ^s	<10	NA	NA	NA	AA
Corbicula	NA	NA	NA	NA	NA	NA

[:] Note; there were no animals analyzed from the estuarine sites.

Every variable in this set was this same value.

1 : All values were less than detection limits.

NA : Not applicable/Not available. No animals of this species at this site.

III. CONCLUSIONS AND RECOMMENDATIONS

The naturally-occurring wetlands in the San Francisco Bay area and the adjacent estuarine and fresh water areas appear to contain relatively low levels of most metal, PCB, PAH, butyltin, and pesticide contaminants in soil/sediment, plants, and animals. Metals such as lead, chromium and arsenic appeared to have elevated concentrations in some plants and animals. There is, however, a very depauperate faunal component in all the naturally occurring wetlands surveyed, that may be the result of a more subtle impact. The introduction and proliferation of a tiny exotic clam from Asia, Potamocorbula amurensis may be a contributing factor. This species out-competes and is a more efficient feeder than existing species. In the brackish and freshwater sites, the clam Corbicula was represented also by many shells and only a few live animals. The invasion of Potamocorbula amurensis also includes brackish waters such as in Suisun Bay. Snails were equally scarce on all sites but Site 8. This lack of animals is quite peculiar since the snails, and mussels are invasive species from the U. S. East Coast, and the clams are an equally opportunistic species from Asia. While it is likely that the introduction of the exotic species (Nassarius, Modiolus, and Corbicula) accompanied some disturbance of the California wetlands, these are very hardy species and would have been expected to survive subsequent disturbances. However, Potamocorbula amurensis could even be out-competing these species. This survey was conducted toward the end of a five year drought experienced in the region. This climatic condition no doubt influenced the existing fauna available for sampling. Further documentation of the fauna of the San Francisco Bay area wetlands appears to be warranted. In addition, further evaluation of the status of arsenic, lead and chromium in wetland foodwebs in the San Francisco Bay area.

The data presented in this report establishes an initial baseline for wetlands in the San Francisco Bay Area and can be used to interpret wetland test results for wetland creation or restoration projects. As more information becomes available, this baseline should be updated to include all ongoing and future data collection activities.

REFERENCES

- Barr, A. J., Goodnight, J. H., Sall, J. P., and Helwig, J. T., American Public Health Association. 1976. "A Users Guide to SAS 76," SAS Institute, Inc., Raleigh, NC.
- Fernald, M. L. 1950. "Gray's Manual of Botany," 8th ed. Corrected Printing 1970. Van Nostrand Co., N.Y.
- Gosner, Kenneth L. 1979. "A Field Guide to the Atlantic Seashore," Houghton Mifflin, Boston, MA.
- Josselyn, Michael. 1983. "The Ecology of San Francisco Bay Tidal Marshes: A Community Profile". Report FWS/OBS-83/23. U.S. Fish and Wildlife Service, Slidell, LA.
- Krone, C.A., Brown, D.W., Burrows, D.G., Bogar, R.G., Chan, S.L. and Varanasi, U. "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound", Marine Environmental Research. 27. pp 1-18.
- Lee, C. R., et al. 1991. General Decision Making Framework for Management of Dredged Material, Example Application to Commencement Bay, Washington, Miscellaneous Paper D-91-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Nielson, K.K., and Sanders, R.W. 1983. "Multielement Analysis of Unweighed Biological and Geological Samples Using Backscatter and Fundamental Parameters." Adv. X-ray Anal. 26, pp 385-390.
- Rice, C.D., Espourteille, F.A., Huggett, R.J. 1987. "Analysis of Tributyltin in Estuarine Sediments and Oyster Tissue, <u>Crassostrea virginica</u>. Applied Organometal Chemistry., 1, pp 541-544.
- Unger, M.A., MacIntyre, W.G., Greaves, J., and Huggett, R.J. 1986. "GC Determination of Butyltins in Natural Waters by Flame Photometric Detection of Hexyl Derivatives with Mass Spectrometric Confirmation." Chemosphere 15(4), pp 461-470.
- USEPA. 1984. United States Environmental Protection Agency, "EPA Par VIII 40 CFR, Part 136, Methods 608 and 625".
- USEPA. 1986. United States Environmental Protection Agency Office of Solid Waste and Emergency Response, "Test Methods for Evaluating Solid Wastes, SW-846 Methods 8080 and 8270". 3rd Ed.

APPENDIX A

Field Survey

Plant and Animal Tissue Concentrations

a. Plant Codes

SPA <u>Spartina Foliosa</u>
SCI <u>Scirpus olynei</u>
SAL <u>Salicornia subterminalis</u>
TYP <u>Typha latifolia</u>

b. Animal Codes

SN <u>Cerithidea</u> ?
CB <u>Corbicula</u> <u>fluminea</u>
MO <u>Modiolus</u> <u>demissus</u>

PLANT METAL RESULTS

(Concentrations in mg/kg Dry Weight, ppm)

Cr Ou NI PB U 6.9 U 6.43 3.24 4.9 0 U 6.9 U 6.44 4.29 3.6 0 U 6.9 U 4.64 4.29 3.6 0 U 6.3 U 4.63 1.96 4.0 0 U 4.7 U 4.63 1.96 4.0 0 U 4.2 U 7.92 3.07 4.1 4.7 U 4.2 U 11.46 2.68 2.5 U 4.1 4.7 U 4.2 U 11.46 2.68 2.5 U 4.1 4.7 U 4.2 U 13.9 6.07 3.9 4.6 0 U 4.2 U 13.9 6.07 3.9 4.6 0 U 4.2 U 13.9 2.4 4.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Battelle	Sponsor				:	i	•	ē	•	3	1
S.G. FRB.SPA 1.1 U 5.1 U 8.86 3.29 2.7 U 0.81 U 44.9 0.2 C 0.2 C 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.03 0.04 0.04 4.2 C 0.04 4.9 C 0.05 0.04 0.04 0.04 4.2 C 0.04 4.2 C 0.04 4.0 C 0.04 </th <th>Code</th> <th>Code</th> <th>γs</th> <th>Ö</th> <th>ð</th> <th>Z</th> <th>£</th> <th>8</th> <th>47</th> <th>49</th> <th>3</th> <th>Ε</th>	Code	Code	γs	Ö	ð	Z	£	8	47	49	3	Ε
6. HANSPA 120 650 644 450 056 056 057 0003 0003 0003 0004 057 057 057 057 057 057 057 057 057 057	246.4	858.5PA	1.10	5.10	9.86	3.29	2.7 U	0.81 U	44.9	0.2	0.22	0.008
S.6. FIASPA 110 6.6 4.64 4.20 3.6 0.79 U 20.5 0.07 0.09 S.6. FRASPATA, 3 1.10 6.44 4.61 4.61 4.61 0.79 U 3.05 0.014 0.005 B RASPATA, 3 0.10 4.70 4.61 2.71 4.41 2.71 4.71 4.71 2.71 0.79 U 3.05 0.01 0.005 B RASAL-2 0.94 3.70 1.14 2.21 2.71 2.71 2.71 0.72 U 2.00 0.02 0.005 1 RDSAL-2 0.94 3.70 1.14 2.22 3.77 2.74 2.70 0.07 0.00 <	246.2	₩ G C G P G	101	0.69	6.43	3.24	4.9	0.85 U	25.9	0.13	0.043	0.012
S.G. FRANSFA-12.3 1.2 ii 6.4 ii 4.6 ii 3.0 ii 0.05 HANSAR 1.9 ii 4.0 ii 4.0 ii 4.0 ii 4.0 ii 0.05 HANSAR 1.9 ii 4.0 ii 7.2 ii 4.1 ii 4.7 ii 0.70 ii 0.05 HDSAL-1 0.94 ii 3.7 ii 1.0 ii 4.2 ii 7.7 ii 1.0 ii 0.05 HDSAL-2, 1 1.0 ii 4.2 ii 7.82 ii 0.77 ii 0.00 0.00 1.14 RICSAL-2, 2 1.0 ii 4.2 ii 7.82 ii 0.77 ii 1.0 ii 0.00 1.15 RICSAL-2, 3 1.1 ii 4.0 ii 8.0 ii 3.0 ii 0.77 ii 1.0 ii 0.00 1.15 RICSAL-2, 4 1.1 ii 4.0 ii 8.0 ii 3.0 ii 0.77 ii 1.0 ii 0.00 0.00 1.1 RED-ARL-2, 4 0.97 ii 4.2 ii 7.2 ii 0.77 ii 1.0 ii 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	2.5.5	A 0.24 C 0	11	n 9	4.64	4.29	3.6	0.79 U	28.5	0.07	0.043	600.0
HA.5PA HA.5PA C.96	240-3	DOA. CDA. 4 4 4	101	6.6	6.44	4.61	3.0	0.85 U	30.5	0.14	0.063	0.05
REB.SPA-1.2	248.7	DIA.SPA	N 96 0	4.7 U	4.63	1.96	4.0	0.74 U	27.6	0.11	0.055	900.0
HID-SAL-1 HID-SAL-2 HID-SAL-2 HID-SAL-2 HID-SAL-2 HID-SAL-2 HID-SAL-2 HID-SAL-3 HID-SAL-1 HID-SAL-1 HID-SAL-2 HID-SAL-1 HID-SAL-2 HID-SAL-1 HID-SA	7.02.7	D2B.SDA.4.2	111	6.3 U	7.2	- 11.4	4.7	0.76 U	34.8	0.23	990'0	0.05
HD-SAL-2	0.050	BID.SAL-1	76.0	3.7 U	10.45	2.71	2.4 U	0.70 U	16.6	0.01	690.0	0.012
Heicski-1, Hei	07.07.0	BIO.5A1.2	U 96.0	3.7 U	11.46	2.68	2.5 U	0.72 U	20.0	0.02	0.093	0.016
H.C.SAL-2.4 12.0	77.07.07.0	BIC.SAL-13	1.0 U	4.2	7.92	3.07	4.1	0.77 U	18.0	0.01	0.051	0.01
RED-SAL-1,	243-12,14	BIC.SAL-2.4	2.5	4.8 U	8.93	2.47	2.9 U	0.87 U	18.5	0.05	0.082	0.017
RED-SAL-2.4 0.96 U	246.46.40	B2D.SAL-1.3	1.10	10.6	13.9	6.07	3.9	0.78 U	31.5	0.03	0.089	0.022
H1GC-TYP-1,2 0.87 U 4.2 U 5.12 4.27 2.8 0.62 U 34.3 0.01 U 0.07 H1GC-TYP-1,2 0.89 U 8 7.59 9.40 2.3 0.65 U 98.6 0.01 U 0.07 H1GC-TYP-1,2 0.89 U 4. U 4.5 9.40 2.3 0.65 U 98.6 0.01 U 0.04 H1GL-TYP-1,2 0.89 U 4.1 U 4.10 9.41 7.40 4.0 0.65 U 98.8 0.01 U 0.04 U 1.0 0.04 U 1.0 0.05 U 0.0	246.47.49	B20.SAL.2.4	0.96 U	5.2 U	11.7	3.03	4.6	0.74 U	23.2	0.01 U	1.0	0.014
High-Typ-12 0.9 U	245.20.25	B13C.TYP.19	0.87 U	4.2 ∪	5.12	4.27	2.8	0.62 U	34.3	0.01 U	0.02	0.016
High-Type Control High-Type High-T	2,02.02.02	B138.TYP.1.2	0.9 U	60	7.59	9.40	2.3	0.63 U	93.6	0.01 U	0.14	0.015
H13A-TYP 0.91 7.1 U 9.41 7.40 4.0 0.66 U 61.0 0.01 U 0.13 H10A-TYP 0.81 7.1 U 10.18 2.54 2.1 U 0.69 U 21.3 0.03 0.1 H10A-TYP 0.79 U 3.4 U 4.06 2.64 2.19 0.63 U 19.0 0.01 U 0.035 H10A-TYP 0.79 U 3.4 U 4.06 2.64 2.19 0.63 U 19.0 0.01 U 0.035 H10B-TYP-1.2 0.77 U 3.6 U 4.95 2.16 1.9 U 0.63 U 17.8 0.02 0.057 H10B-TYP-1.2 0.77 U 3.6 U 4.95 2.16 1.9 U 0.63 U 17.8 0.02 0.057 H10B-TYP-1.2 0.77 U 3.6 U 4.95 2.16 1.9 U 0.63 U 17.8 0.02 0.057 H10B-TYP-1.2 0.82 U 3.9 6.64 7.92 2.50 0.64 U 21.2 0.15 0.055 H10B-TYP-1.2 0.82 U 3.9 6.64 7.92 2.50 0.64 U 21.2 0.13 0.03 H10B-TYP-1.2 0.03 U 4.2 U 10.13 2.00 U 0.63 U 4.9.2 0.05 0.37 H10B-TYP-1.2 0.03 U 4.2 U 10.13 2.00 U 0.69 U 49.2 0.05 0.37 H10B-TYP-1.2 0.79 U 3.9 6.64 7.92 2.50 0.65 U 49.2 0.05 0.37 H10B-TYP-1.2 0.77 U 6.4 6.83 4.26 2.00 U 0.65 U 41.3 0.05 H10B-TYP-1.2 0.77 U 6.4 6.8 4.04 2.00 U 0.69 U 41.3 0.05 H10B-TYP-1.2 0.77 U 6.8 B 4.04 2.00 U 0.69 U 41.3 0.05 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.60 U 41.3 0.05 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.05 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.75 U 4.6 6.52 1.66 2.00 U 0.79 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.05 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.05 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.05 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.75 U 4.6 6.52 1.00 0.05 U 45.2 0.01 U 0.094 H10B-TYP-1.2 0.79 U 7.7 0.79 U 2.10 U 0.79 U 2.74 0.01 U 0.094 H10B-TYP-1.2 0.79 U 7.7 0.70 U 0.79 U 2.75 0.01 U 0.0	24.27.25	B130.TVP.12	0.83 U	7	*	8.31	2.1 U	0.62 บ	98.8	0.01 U	60.0	0.01
High-TYP Cost 4.1 U 10.16 2.54 2.1 U Cost	245.25 245.25	B13A.TVP	0.91 U	7.1 U	9.41	7.40	4.0	0.66 U	61.0	0.01	0.13	0.014
HONG-TYP	245.27	BioD.TYP	0.87 U	4.1 U	10.18	2.54	2.1 U	0.69 U	21.3	0.03	0.1	0.012
RIOC-TYP 0.79 U 3.5 U 6.36 2.64 2.19 0.63 U 18.6 0.02 0.055 RIOB-TYP-1,2 0.77 U 3.6 U 4.95 2.16 1.9 U 0.63 U 17.8 0.02 0.067 RIOB-TYP-1,2 0.99 U 8.9 6.1 7.40 2.7 0.72 U 25.5 0.06 0.064 RIOB-TYP-1,2 0.92 U 3.9 6.64 7.92 2.50 0.62 U 43.5 0.05 0.037 REP 2 R9B-SCI-1,2 REP 2 0.92 U 3.9 3.9 2.03 2.50 0.65 U 43.5 0.05 0.037 REP 2 R9B-SCI-1,2 REP 3 0.03 U 4.2 U 10.13 2.03 2.50 0.65 U 43.5 0.05 0.038 REP 2 R9B-SCI-1,2 REP 3 0.75 U 4.4 8.4 5.65 2.00 U 0.60 U 41.7 0.05 0.19 REP 2 R9B-SCI-1,2 REP 3 0.75 U 4.4 8.4 5.65 2.00 U 0.60 U 41.7 0.05 0.19 REP 3 R9B-SCI-1,2 REP 4 0.75 U 4.4 8.4 5.65 2.00 U 0.60 U 41.7 0.05 0.19 REP 3 R9B-SCI-1,2 REP 5 0.75 U 4.4 8.4 5.65 2.00 U 0.60 U 41.7 0.05 0.19 RFC-SAL-1	24.5.50 04.5.00	B10A.TVP	0.79	3.4 U	4.06	2.28	2.0 U	0.63 U	19.0	0.01 U	0.035	0.016
REP 1 REP 2 REP 3 REP 1 REP 3 REP 4 REP 4 REP 4 REP 4 REP 4 REP 5 REP	24 5.00	R10C-TYP	0.79 U	3.5 U	5.36	2.64	2.19	0.63 U	18.6	0.02	0.055	0.022
HTB-SPA HTB-SCI-12.3 HEP 1 0.82 0.64 U 21.2 0.012 0.037 0.038 0.039 0.038 0.039 0.03	2 C C C C C C C C C C C C C C C C C C C	R108.TYP-1.2	0.77 U	3.6 U	4.95	2.16	1.9 U	0.63 U	17.8	0.02	0.067	0.026
HEP 1 HB-SPA	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	R7B.SPA	U 66.0	6.8	6.1	7.40	2.7	0.72 U	25.5	90.0	0.064	0.017
REP 1 R9B-SCI-12.3 REP 1 0.82 U 3.9 6.64 7.92 2.50 0.62 U 43.5 0.06 0.37 REP 2 R9B-SCI-12.3 REP 2 0.82 U 3.6 U 7.72 8.95 2.1 U 0.63 U 49.2 0.06 0.38 R9C-SCI 0.03 U 4.2 U 10.13 2.03 2.50 0.65 U 49.2 0.05 0.38 R9C-SCI 0.03 U 4.2 U 10.13 2.03 0.65 U 41.7 0.09 0.05 RPD-SCI-12.3 REP 1 0.71 U 6.4 6.8 4.26 2.00 U 0.65 U 41.7 0.09 REP 2 R9A-SCI-12.3 REP 1 0.71 U 6.4 6.6 8.79 5.37 2.00 U 0.60 U 41.7 0.05 0.05 REP 2 R9A-SCI-12.3 REP 2 0.75 U 6.6 8.79 5.37 2.30 U 0.60 U 41.7 0.05 0.05 RFP 2 RFC-SAL-1 0.93 U 5.70 U 6.8 6.8 6.8 6.8	30.044	B1B.SPA	0.86 U	7.1	4.35	4.34	2.5	0.64 U	21.2	0.12	0.032	0.015
HEP 2 H9B-SCI-1.2.3 REP 2 0.82 U 3.6 U 7.72 8.95 2.1 U 0.63 U 49.2 0.05 0.38 H9C-SCI 0.03 U 4.2 U 10.13 2.03 2.50 0.65 U 39.7 0.09 0.35 H9C-SCI 0.03 U 4.2 U 10.13 2.03 2.50 0.65 U 39.7 0.09 0.35 H9C-SCI 0.79 U 3.9 5.52 1.97 2.00 U 0.58 U 27.2 0.04 0.19 0.35 HSP 2 0.71 U 6.4 6.83 4.26 2.00 U 0.58 U 27.2 0.04 0.19 0.2 HSP 2 0.71 U 6.4 6.83 4.26 2.00 U 0.60 U 41.7 0.05 0.2 HSP 2 H9A-SCI-12.3 REP 2 0.75 U 4.4 8.4 5.65 2.00 U 0.60 U 41.7 0.05 0.19 HSP 2 H9A-SCI-12.3 REP 2 0.75 U 6.6 B 8.79 5.37 2.30 U 0.60 U 41.3 0.05 0.14 H7.5 SAL-1 0.93 U 5.7 U 6.8 8.6 8.6 2.80 0.65 U 15.7 0.02 0.03 HSC-SAL-1 0.62 U 6.8 8.6 8.6 2.80 0.65 U 15.7 0.02 0.03 HSC-SAL-1 0.79 U 4.5 5.0 U 0.05 U 45.2 0.01 U 0.083 HSC-SAL-1 0.79 U 0.79 U 0.79 U 0.79 U 0.09 U 45.2 0.01 U 0.09 U		R98.SCL12.3 REP 1	0.82 U	3.0	6.64	7.92	2.50	0.62 U	43.5	90.0	0.37	0.026
H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI-1,2 H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H4C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H9C-SCI H4C-SCI H9C-SCI H9	9 2	R9B.SCL123 REP 2	0.82 U	3.6 U	7.72	9.95	2.1 U	0.63 U	49.2	0.05	0.38	0.024
39 R9D-SCI-1,2 0.79 U 3.9 5.52 1.97 2.00 U 0.58 U 27.2 0.04 0.19 1.42 REP 1 R9A-SCI-1,23 REP 1 0.71 U 6.4 6.83 4.26 2.00 U 0.60 U 41.7 0.05 0.2 1.42 REP 2 R9A-SCI-1,23 REP 1 0.75 U 4.4 8.4 5.65 2.0 U 0.60 U 41.3 0.05 0.19 R7C-SAL-1 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.04 R7C-SAL-2 0.62 U 6.8 8.68 5.66 2.80 0.65 U 15.7 0.02 0.039 R5C-SAL-1 1.18 7.9 U 10.5 5.40 0.90 U 45.2 0.01 U 0.094 R4D-SAL-1 0.91 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 0.094 R4D-SAL-1 0.91 U 4.6 6.52 1.66 2.10 U 0.79 U 30.7 0.02 0.16 R4D-SAL-1 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 R7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 R7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.10 N/A	į	B9:0.5C1	0.03 U	4.2 U	10.13	2.03	2.50	0.65 U	39.7	60.0	0.35	0.012
1.42 REP 1 R9A-SCI-1;23 REP 1 0.71 U 6.4 6.83 4.26 2.00 U 0.60 U 41.7 0.05 0.2 0.2 0.19 1.42 REP 2 R9A-SCI-1;23 REP 2 0.75 U 4.4 8.4 5.65 2.0 U 0.60 U 41.3 0.05 0.19 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.05 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.05 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.05 1.15 7.9 U 10.5 5.40 U 0.79 U 22.4 0.02 0.03 1.18 7.9 U 10.5 5.40 0 0.90 U 45.2 0.01 U 0.083 1.18 7.9 U 10.5 5.40 0 0.90 U 45.2 0.01 U 0.094 1.18 7.9 U 10.5 5.40 U 0.79 U 0.79 U 0.094 1.10 B 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 1.10 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 1.10 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 1.10 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 1.10 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.01	245.38.39	R9D-SCI-1.2	0.79 U	3.9	5.52	1.97	2.00 U	0.58 U	27.2	0.04	0.19	0.024
HAZ REP 2 R9A-SCI-1,2.3 REP 2 0.75 U 4.4 8.4 5.65 2.0 U 0.60 U 41.3 0.05 0.19 R7C-SAL-1 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.067 R7C-SAL-1 0.93 U 5.7 U 8.88 4.04 2.40 U 0.79 U 22.4 0.02 0.14 R7.SAL-2 0.62 U 6.8 8.68 5.66 2.80 0.65 U 15.7 0.02 0.019 R5C-SAL-1 1.18 7.9 U 10.5 5.40 U 0.69 U 45.2 0.01 U 0.083 R5C-SAL-1 0.76 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 0.094 R4D-SAL-2 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 R7D-SAL-3 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1		R9A-SCI-1,2,3 REP 1	0.71 U	6.4	6.83	4.26	2.00 U	0.60 U	41.7	0.05	0.5	0.02
R7C-SAL-1 1.14 6.6 8.79 5.37 2.30 U 0.69 U 19.5 0.02 0.067 R7.SAL-2 0.93 U 5.7 U 6.8 4.04 2.40 U 0.79 U 22.4 0.02 0.14 R5C-SAL-1 0.62 U 6.8 8.68 5.66 2.80 0.65 U 15.7 0.02 0.03 R5C-SAL-1 1.18 7.9 U 10.5 5.40 0.90 U 45.2 0.01 U 0.083 R4D-SAL-1 0.76 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 U 0.094 R4D-SAL-2 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 R7D-SAL-2 2.54 17.7 19.20 5.40 U 0.73 U 37.5 0.05 0.1 R7D-SAL-3 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.01 U R7D-SAL-3 0.00 U 0.73 U 0.02 U 0.01 U 0.01 U 0.01 U 0.01 U 0.01 U 0.01 U	R		0.75 U	4.4	8.4	5.65	2.0 U	0.60 U	41.3	0.05	0.19	0.021
H7.SAL-2 0,93 U 5,7 U 8,88 4,04 2,40 U 0,79 U 22.4 0,02 0,03 H5.7 0,03 0,03 H5.2 1,18 7,9 U 10.5 5,40 2,10 U 0,63 U 1,204 0,01 0,094 H4D.SAL-3 0,91 U 8 11.09 2,14 2,40 U 0,79 U 30,7 0,03 0,16 H7D.SAL-3 1,00 U 7,7 7,0 U	į	R7C-SAL-1	1.14	9.9	8.79	5.37	2.30 U	O 69.0	19.5	0.02	0.067	0.011
#5C-SAL-1 0.62 U 6.8 8.68 2.80 0.65 U 15.7 0.02 0.039 #5C-SAL-2 1.18 7.9 U 10.5 5.40 2.60 U 0.90 U 45.2 0.01 U 0.083 #5C-SAL-2 0.76 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 0.094 #4D-SAL-1 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 #7D-SAL-1 2.20 25.4 17.7 19.20 5.40 0.73 U 37.5 0.05 0.1 #7D-SAL-2 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 #7D-SAL-2 N/A N/A N/A N/A N/A N/A 0.01 0.01 U	245.44	R7.SAL-2	0.93 U	5.7 U	8.88	4.04	2.40 U	0.79 U	22.4	0.02	0.14	0.017
R5C-SAL-2 1.18 7.9 U 10.5 5.40 0.90 U 45.2 0.01 U 0.083 R4D-SAL-1 0.76 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 0.094 R4D-SAL-2 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 R7D-SAL-1 2.20 25.4 17.7 19.20 5.40 0.73 U 37.5 0.05 0.1 R7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 R7D-SAL-2 N/A N/A N/A N/A N/A N/A 0.01 0.01 U	1 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	R5C-SAL-1	0.62 U	6.8	89.8	99.6	2.80	0.65 U	15.7	0.02	0.039	0.012
R4D-SAL-1 0.76 U 4.6 6.52 1.66 2.10 U 0.63 U 12.04 0.01 0.094 R4D-SAL-2 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 R7D-SAL-1 2.20 25.4 17.7 19.20 5.40 0.73 U 37.5 0.05 0.1 R7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 N/A N/A N/A N/A N/A N/A 0.01 0.01 U	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	B5C.SAL.2	1.18	7.9 U	10.5	5.40	2.60 U	0.90 U	45.2	0.01 U	0.083	0.013
H4D-SAL-2 0.91 U 8 11.09 2.14 2.40 U 0.79 U 30.7 0.02 0.16 2.70 SAL-1 2.20 2.5.4 17.7 19.20 5.40 0.73 U 37.5 0.05 0.1 H7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 N/A N/A N/A N/A N/A N/A N/A N/A N/A 0.01 0.01 U	24 5 1 1 C	B4D-SAL-1	0.76 U	4.6	6.52	1.66	2.10 U	0.63 U	12.04	0.01	0.094	0.014
R7D-SAL-1 2.20 25.4 17.7 19.20 5.40 0.73 U 37.5 0.05 0.1 R7D-SAL-1 1.00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1 N/A N/A N/A N/A N/A N/A N/A 0.01 0.01 U	24.0	840.SAL-2	0.91 U	60	11.09	2.14	2.40 U	0.79 U	30.7	0.02	0.16	0.019
R7D-SAL-2 1,00 U 7.7 8.94 2.96 2.60 U 0.86 U 22.6 0.01 U 0.1	245.40	B70.SAL-1	2.20	25.4	17.7	19.20	5.40	0.73 U	37.5	0.02	0.1	0.059
N/A N/A N/A N/A N/A N/A N/A N/A N/A 0.01 0.01 U	24.5.50	R7D-SAL-2	1.00 U	7.7	8.94	2.96	2.60 U	0.86 U	22.6	0.01 U	0.1	0.016
	elli lembooce		X /X	Y/N	٧/٧	Y / X	K/A	Y'X	K/N	0.01	0.01 U	0.004

U indicates analyte not detected at detection limit shown N.A indicates not appropriate for XRF analyses.

STANDARD REFERENCE MATERIAL

(Concentrations in mg/kg Dry Weight, ppm)

Battelle Sponsor											
Code		V3	ŏ	ō	Z	£	8	Zn	Ag	8	£
SRM 1571 ORCHARD LEAVES, REP 1		11.2	4.3 U	12.7	1.07	45.7	0.77 U		0.01		0 130
SAM 1571 OHCHARD LEAVES, REP 1A	<	8.72	4.1 U	12.4	1.57	48.5	0.70 U	26.2	0.01 U	U 0.16	
SOM 1571 ORCHARD LEAVES, HEP 2		10.54	3.6 U	11.68	1.49	43.5	0.60 U				
SOM 1571 OHCHAND LEAVES, HEP 2A	•	9.97	3.5 U	11.23	1.20	43.3	0.60 U				
SOM 1371 ONCHAND LEAVES, HEP 3		10.1	ĸ	10.75	1.05	43.5	0.59 U				
Certified Value:	/alue:	14 ±2	2	12 ± 1	1.3 ±0.2	45 ±3	0.08 ±0.01	25 ±3	2	0.11 ±0.02	±0.02 0.155 ±0.015
SRM 1566A OYSTER TISSUE (RICHLAND), REP 1	(ND), REP 1	14.43	3.3 U	65.7	2.20	2.9		672.0	1.28	* 00	0
SPIN 1566A OYSTEM TISSUE (MSL), REP	EP 1	13.59	3.5	68.4	2.05	3.6	2.04	892.0	1.46	4.15	
STATE TO THE TISSUE (HICKLAND), HEP 2	NO), HEP 2	14.98	9.	64.7	2.20	2.0 U		817.0			
SHM 1564 OTSTEH JISSUE (MSL), HEP 2	EP2	14.95	3.1 C	64.7	2.18	2.5		837.0			
SHM 1966A OYSTEM TISSUE (RICHLAND), REPO	NO), REP 3	13.35	3.1 C	62.7	2.14	2.1		845.0			
SHM 1566A OYSTEH IISSUE (MSL), REP 3	EP 3	14.93	3.3 U	94.6	1.85	1.9 U		884.0			
Certified	Certified Value:	14 ±1.2	1.43 ±0.46	66.6 ± 4.3	66.6 ± 4.3 2.25 ±0.44;71 ±0.014*	±0.014*	2.21 ±0.24	830 ±57	1.68 ±0.15	4.15 ±0.38	0.0642 ±.0067

^{*} Lead determined by ICP-MS, not XRF.

PAH RESULTS FOR WES PLANT SAMPLES (Concentrations in ug/Kg Dry Weight, ppb)

cf# 245

Benzo-	(g,h,l)-	perylene	10 U	10 U	10 01	10 U	10 U	10 U	10 U	10 U	10 0	10 01	10 0	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 C	10 U	10 U	10 C	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	=				
	Benzo[a]	pyrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	= 0				
Benzo[k]	Fluor- B	anthene	10 U	10 U	10 0	10 U	10 U	10 U	10 U	10 0	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 C	10 U	10 U	⊃ •	10 U	10 U	10 U	10 U	10 U	10 U	10 0	10 U	-				
Benzo[b]	Fluor-	anthone	10 U	10 U	10 U	10 U	10 01	10 C	10 U	10 U	10 U	10 U	10 C	10 U	10 C	10	10 U	10 U	10 U	10 C	10 U	10 U	10 U	10 U	10 U	10 U	10 C	10 C	10 D	10 C	10 10	10 C	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 0	= 0
Benzo[a]	Anthra-	cene	10 U	10 U	10 C	10 0	10 0	10 U	10 U	10 U	10 U	10 U	10 0	10 U	10 C	10 0	10 U	10 0	. 10 U	10 U	10 C	10 C	10 U	10 U	10 U	10 C	10 C	10 C	10 C	10 U	10 C	10 C	10 U	10 U	10 U	10 U	10 0	10 U	10 U	10 U	= <
	Anthra-	cene	10 U	10 U	10 U	10 U	26	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 C	10 U	10 U	10 U	10 U	- 10 C	10 U	10 U	10 C	10 U	10 U	10 C	10 C	10 U	10 C	10 C	10 0	10 U	10 U	10 U	10 0	10 C	10 C	10 C	= 5
	Acenaph-	thylene	10 U	10 U	10 U	10 U	10 C	10 0	10 U	10 U	10 U	10 U	10 0	10 U	10 L	10 U	10 C	10 C	10 U	10 U	10 L	10 U	10 L	10 U	10 U	10 t	10 1	10 0	10 L	10 U	10 t	10 T	100	10 L	10 U	10 L	10 0	10 C	10 0	10 L	-
	Acenaph-	thene	10 U	10 U	10 U	10 U	10 01	10 U	10 U	10 U	10 0	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 10	10 C	10 U	10 U	D 01	10 U	10 0	10 U	10 C	= <-
		% Moist.	¥	86	8	8	80	82	80	73	91	72	60	73	8	ž	86	88	8	06	88	82	9	82	90	96	≨	77	80	ž	82	ž	75	78	93	7.4	83	76	88	80	0
	Date	Anald	4/11/91	4/11/91	4/11/91	4/11/91	4/11/91	4/11/91	4/11/91	4/11/91	4/11/91	14/11/91	4/11/91	4/11/91	4/11/91	12/12/90	12/12/90	12/12/90	12/12/90	12/14/90	12/12/	12/12/	12/12/90	12/12/90	12/12/	12/14/	12/14/	12/12/	12/13/90	12/13/	12/13/	12/13/90	12/13/90	12/13/	12/13/	12/13/	12/13/	12/13/	12/13/90	12/13/90	00/69/61
	Date	Ext'd	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	3/18/91	11/29/90	11/29/90	11/29/90	11/29/90	12/13/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	12/13/90	12/13/90	11/29/90	11/29/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90 12/13/	11/30/90 12/13/	1410100100111
	Sponsor	Code	BLANK 1	R5B-SPA	R4B-SPA	R7A-SPA	R2A-SPA-1,2,3		R28-SPA-1,2		RID-SAL-2	RIC-SAL-1,3	RIC-SAL-2,4	R2D-SAL-1,3	R20.SAL-2,4	BLANK 2	R13C-TYP-1,2	R13B-TYP-1,2	R13D-TYP-1,2	R13A-TYP	R10D-TYP	R10A-TYP	R10C-TYP	R108-TYP-1,2	R7B-SPA	R18.SPA	RIB-SPA, DUP	R9B-SCI-1,2,3	H9C-SCI	BLANK 3	H9D-SCI-1,2	R90-SCI-1,2	R9A-SCI-1,2,3	R7C-SAL-1	R7-SAL-2	H5C-SAL-1	R5C-SAL-2	R4D-SAL-1	H4D-SAL-2	R7D-SAL-1	0 110
	Battelle	Code	BLANK 1	245-1	245-2	245-3	245-4,5,6,	245-7	245-8,9	245-10,	245-11	245-12,14	245-13,15	245-16,18	245-17,19	BLANK 2	245-20,21	245-22,23	245-24,25	245.26	245-27	245-28	245.29	245-30,31	245-32	245.33	245-33, DUP	245-34,35,36	245-37 :	BLANK 3:	245.38,39	245.38,39 DUP	245-40,41,42	245-43	245-44	245-45	245-46	245.47	245-48	245.49	

U indicates analyte not detected at detection limit shown

B indicates analyte present in blank associated with that sample (one method blank was run on each date)

NA indicates not applicable

PAH RESULTS FOR WES PLANT SAMPLES (Concentrations in ug/Kg Dry Weight, ppb)

Battelle	Sponsor	Date	Cate		Dibenzo-	i		Indeno-				
Code	900 20	Ext.d	Anal'd	Chareene	-(a,n)	-Joni-		1,2,3-	2-Methyl-	Naph-	Phenan-	
BLANK 1	BLANK 1	3/18/91	4/11/4		anninacene	animene	Fluorene	Pyrene	Naphthene	thalene	threne	Pyrene
245-1	R5B.SPA	3/16/91	4/11/91	•		2 5	100		20	2	10 U	10 U
245.2	R4B-SPA	3/18/91	4/11/91			2 9		0 0 0	20		10 U	10 U
245.3	R7A.SPA	3/18/91	4/11/91	2 0		2 \$		0 01	Ö		38	10 U
245-4,5,6,	R2A-SPA-1,2,3	3/18/91	4/11/91			2 \$					37	10 C
245.7	R1A-SPA	3/18/91	4/11/91	2 0		2 \$		10 0		20 U	30	10 U
245-8,9	R2B-SPA-1.2	3/18/91	4/11/01			2 (6 : C :	10 0		63	31	
245-10	RID-SAL-1	3/18/01	4/11/10			0 :	10 1	10 C	32	50 U	20	
245-11	RID-SAL-2	3/48/04	4/14/04			0 :	10 C	10 0	20 .	J 50 U	40	
245-12,14	RIC-SAL-1.3	3/18/91	4/11/01	2 9		2 :	0 0 0	100		380	130	100
245-13,15	RIC-SAL-24	3/18/01	4/11/01			0.	D 01			20	10	
245.16,18	R2D-SAL-1 3	3/18/01				0.	D 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		20 (J 50 U	28	
245.17.19	820.SAL.24	2/40/41/6	10/11/4	2 :		0	n 0 C		37	6 0		
BLANK 2	PI ANK 2	18/01/0	18/11/4	0 0 0		2	U 10 U	10 U	20 (J 50 U	101	5 5
245.20.21	D12C.TVD. 4.0		06/21/21	01		0	10 C	10 0	20 (20 0		
245-22.23	A138.TVP. 1.9		12/12/90	2 .		0	10 C	10 U	38			2 5
245.24.25	DISD. TVB 4.5		06/21/21	0 0 0		0	U 10 U	10 U	20 1	42	200	_
245.26	B13A.TVD	00/67/11	12/12/90	0.0		0	U 10. U	10 U		N		2 5
245.27	AVT. COL		12/14/90	2 :		0	U 10 U	10 U	0	4		
245.28	B10A.TVD	06/62/11	12/12/90	0 :		2	U 10 U	10 U		6.0	. 0	2 9
245.29	B10C.TVD		06/21/21	2:	200	2	U 10 U	10 U		63	101	2 5
245.30.31	B10B.TVB.4.9	_ ,	06/21/20	0 :		2	10 C	10 U				2 5
245.32	878.SPA	106/62/11	2/12/90	100		-	U 10 U	10 U		52	= ==	5 5
245-33	A1B.SPA	_ ,	06/21/21	0.00		9	U 10 U	10 U	20 U	8		- -
245-33. DUP	RIB.SPA DIP		06/41/2	2 9	001	9	10 U	10 U	20 U	4	. 	5 5
245-34.35.36	R9B.SCL.1.2.3	_	08/61/2	2 :		9		10 U	20 U	*	. 1.	5 0
245-37	R9C-SCI		2/42/00	2 9		<u>က</u>		10 U	20 U	18	. 	
BLANK 3	BLANK3	•	12/13/00		-		0	-		a		10 L
245-38,39	R9D-SCI-1.2	•	12/13/90			2 :			20 U	30	10 0	100
245-38,39 DUP	_	•	12/13/90			= \$		200			=	10 0
245-40,41,42			12/13/90	2 0 0		2 6					10	100
245-43	R7C-SAL-1		12/13/90	2 5	=	7 4		10 0			17	9
245.44	R7-SAL-2		12/13/90	_		2 ;	ח סו	10 C	20 U		10 C	10 01
245.45	R5C-SAL-1		12/13/90	2 5			0 0 1			9	2	13
245-46	R5C-SAL-2	-	12/13/90			2 9				30 U	10 U	10 0
245.47	R4D-SAL-1		06/61/2				-		20 U			100
245-48	R40.SAL-2	11/30/90 12	12/13/90	2 5) OF		20 U	30 U	10 U	100
245-49	R7D-SAL-1		2/13/90	2 5		2 :	000	10 0		4.1	=	10 0
245-50	R70.SAL.2	11/30/00 13/13/00	2/12/00	2 6		= ;	D 01	10 U	20 U	30 0	10 01	
	9.300.010	71 26/20/11	08/61/2	0	201	10	10 U	10 U	20 U			2 0
II bediender		3								· _		>

U indicates analyte not detected at detection limit shown. B indicates analyte present in blank associated with that sat the indicates not applicable

PAH RESULTS FOR WES PLANT SAMPLES (Concentrations in ug/Kg Dry Weight, ppb)

SURROGATE PERCERNT RECOVERIES

		i	i	Naph-	Acen-	Phenan-	B(a)P-	Fluorene-	Fluorene- Chrysene-
	Sponsor	Date	Date	ę	9	0,017	412	Ę	412
	83	EXI G	Anal G	900			, 	, EC.	440%
BLANK 1	×-	3/18/91	4/11/91	%86 80 80 80 80 80 80 80 80 80 80 80 80 80	§ \$	Ž Ž	§ §	35%	37%
H5B-SPA	SPA	3/18/91	4/11/91	35%	\$:	\$:	≦ ≘	4000	6 4 4
H48	R4B-SPA	3/18/91	4/11/91	110%	≨:	2 :	\$ \$	1207	110%
H7A	A7A-SPA	3/18/91	4/11/91	79%	<u> </u>	X X	\$ \$	4 10%	410%
4 4 4	HZA-3FA-1,2,3	3/18/91	4/11/4	4204	S S	\$. ≨	130%	110%
B 25	R28.SPA-1.2	3/18/91	4/11/91	76%	ž	ž	≨	95%	82%
2	RID-SAL-1	3/18/91	4/11/91	110%	ž	ž	ž	130%	130%
뭂	RID-SAL-2	3/18/91	4/11/91	110%	ž	ž	Ź	120%	130%
E	RIC-SAL-1.3	3/18/91	4/11/91	36%	ž	ž	Ź	35%	37%
뚪	RIC-SAL-2,4	3/18/91	4/11/91	896 %	≱	ž	Ź	100%	91%
82	R2D-SAL-1.3	3/18/91	4/11/91	94%	ž	ž	Ź	100%	100%
R	R2D-SAL-2,4	3/18/91	4/11/91	22%	ž	≨	Ź	20%	23%
ᇳ	BLANK 2	11/29/90	12/12/90	30 %	20 %	73 %	120	*	
E	A13C-TYP-1,2	11/29/90	12/12/90	72 %	83 %	78 %	120	*	
Œ	R13B-TYP-1,2	11/29/90	12/12/90	73 %	85 %	80 %	120	*	
Œ	R13D-TYP-1,2	11/29/90	12/12/90	84 %	97 %	91 %	136	*	
Œ	R13A-TYP	12/13/90	12/14/90	52 %	63 %	62 %	91	*	
Ě	R100-TYP	11/29/90	12/12/90	78 %	% 06	81 %	130	*	
Œ	R10A.TYP	11/29/90	12/12/90	% 09 %	% 89	63 %	92	%	
Œ	R10C-TYP	11/29/90	12/12/90	75 %	87 %	79 %	125	*	
Œ	R108-TYP-1,2	11/29/90		% 69 %	83 %	77 %	120	*	
Œ	R7B-SPA	11/29/90	12/12/90	35 %	65 %	72 %	110	*	
Œ	R1B.SPA	12/13/90	12/14/90	46 %	65 %	63 %	92	*	
Œ	RIB-SPA, DUP	12/13/90	12/14/90	76 %	87 %	78 %	120	%	
Œ	R9B-SCI-1,2,3	11/29/90	12/12/90	46 %	51 %	20 %	73	*	
Œ	PC-SCI	11/29/90	12/13/90	28 %	65 %	77 %	125	*	
酉	BLANK 3	11/30/90	12/13/90	31 %	* * *	63 %	-	*	
Œ	R9D-SCI-1,2	11/30/90		% 09 %	79 %	75 %	120	*	
Œ	R9D-SCI-1,2	11/30/90	12/13/90	29 %	78%	76 %	120	*	
Œ	R9A-SCI-1,2,3	11/30/90	12/13/90	45 %	% 09	29 %	87	*	
Œ	R7C-SAL-1	11/30/90	12/13/90	26 %	81%	78 %	120	*	
Œ	R7-SAL-2	11/30/90	12/13/90	73 %	86 %	83 %	130	*	
	RSC-SAL-1	11/30/90	12/13/90	% 69 %	85 %	82 %	120	*	
<u>a</u>	RSC-SAL-2	11/30/90	12/13/90	23 %	70 %	84 %	130	*	
č	R4D-SAL-1	11/30/90	1/30/90 12/13/90	% 99	% 08	78 %	120	*	
ď	R4D-SAL-2	11/30/90	1/30/90 12/13/90	67 %	85 %	81 %	120	*	
R	R7D-SAL-1	11/30/90	1/30/90 12/13/90	62 %	87 %	8 9 %	140	*	
R 7	R7D-SAL-2	11/30/90	1/30/90 12/13/90	62 %	85 %	82 %	130	*	

U indicates analyte not detected at detection limit shown B indicates analyte present in blank associated with that sat NA indicates not applicable

PAH MATRIX SPIKE PERCENT RECOVERIES 618 245

Sponsor Code	Date Ext'd	Date Anal'd	% Molst.	Acenaph- thene	Acenaph- ihylene	Anthra- cene	Benzo(a) Anthra- cene	Benzo[b] Fluor- anthene	Ber F and	Benzo(k) Fluor- anthene	Benzo[a] pyrene	Benzo- (g,h,i)- perylene
11/28/90 12/11/90 11/28/90 12/11/90		12/11/90	ž ž	105 %	107 % 114 %	114	% 119 % 129 %	111	* *	103 9	* 104 * * * * * * * * * * * * * * * * * * *	109 %
11/29/90 12/12/90 11/29/90 12/12/90		12/12/90	ž ž	106 %	103 %	===	% 117 % 120 %	107	* *	101 7	% 000 % % % % % % % % % % % % % % % % %	
11/30/90 12/13/90 11/30/90 12/13/90		2/13/90	2 2	8 0 0 % % % % % % % % % % % % % % % % %	2 2 2 4 3 4	101	% 001 % 400 % %	93	* *	0 0 0 0 % %	24 % % % % % % % % % % % % % % % % % % %	110 % 82 %

PAH MATRIX SPIKE PERCENT RECOVERIES

PAH MATRIX SPIKE PERCENT RECOVERIES

					Dibenzo-			-ouepul				
Battelle	Sponsor	Date	Date Anal'd Chr	Chrysene	(a,h)- anthracene	Fluor-	Fluorene	1,2,3- Pyrene	2-Methyl- Naphthene	Naph- thalene	Phenan- threne	Pyrene
800												
	***************************************	44198100	19/11/0/	C		113	111				128	109
Matrix Spike Matrix Spike Dug	Mairix Spike HSA-SPA-1,2,3 Mairix Spike DupRSA-SPA-1,2,3	11/28/90 12/11/90	11/28/90 12/11/90	108 %	129%	129	% 134 %	123 %	NA NA	114 %	144 %	124 %
March enike	89B-SCI-1.2.3	11/29/90	11/29/90 12/12/90	103		143		101 %		45 %	128 %	139 %
Marrix Spike	Marrix Spike Dup R9B-SCI-1,2,3	11/29/90	11/29/90 12/12/90	104 %	112%	123	% 124 %		₹		128	9
	100 400	00/06/44	00/61/61 00/06/44	4.5		104	105	110%	*	84 %	102 %	101 %
Matrix Spike	Matrix Spike Dur R9A-SCI, 1,2,3	11/30/90	11/30/90 12/13/90	86 %	75%	9.6	% 101 %			8 2	9	8

PAH MATRIX SPIKE PERCENT RECOVERIES

SURROGATE PERCENT RECOVERIES

				Naph-	Acen-	Phenan-	B[a]P-
Battelle	Sponsor	Date	Date	,			,
800	8 00	Ext'd	Anald	gp	d10	d1020	412

				Naph-	Acen-	Phenan-	B[a]P.	
Battelle	Sponsor	Date	Date					
ත්ර	Code	Ext'd	Anal'd	9	d10	d1020	d1020 d12	_
Matrix spike	RSA-SPA-1,2,3		11/28/90 12/11/90	57 %	64 %	59 %	6 0	*
Matrix Spike	Matrix Spike Dup RSA-SPA-1,2,3		11/28/90 12/11/90	23 %	49 %	20 %	78 %	*
Marrix spike	R9B-SCI-1,2,3		11/29/90 12/12/90	13 %	300	53 %	100	*
Matrix Spike	Matrix Spike Dup R9B-SCI-1,2,3	11/29/90	11/29/90 12/12/90	36 %	63 %	73 %	110	*
Matrix spike	Matrix spike R9A-SCI, 1,2,3	11/30/90	11/30/90 12/13/90	40	79 %	77 %	140	×
Matrix Spike L	Duc R9A-SCI, 1,2,3	11/30/90	11/30/90 12/13/90	20 %	81%	78 %	110 %	*

PLANT BUTYLTIN RESULTS

(Concentrations in ug/kg Dry Weight, ppm)

Battelle	Sponsor	Date	TETRABUTYL	TRIBUTYL	DIBUTAL.	MONOBUTAL	SURROGATE RECOVERY
Code	Code	Extracted	N.	Z	Z	Z	INFENTALIN
94K.1	PSP.SPA	12/21/90	4.10	4.5 U	3.8 U	3.8 U	76%
245.2	B48-SPA	12/21/90	4.2 U	4.6 U	3.9 U	3.9 U	78%
245.3	R7A-SPA	12/21/90	4.1 U	4.4 U	3.8 U	3.8 U	74%
245.4 5 6	B2A-SPA-1.2.3	12/21/90	2.3 U	2.5 U	2.2 U	2.2 N	65%
245.7		1/15/91	4.7 U	9.5	4.3 U	19.8	. %68
245.89	R28-SPA-1.2	12/21/90	3.1 U	3.4 U	2.9 U	2.9 U	62%
245.10	BID-SAL-1	1/15/91	3.2 U	7.4	2.9 U	21.1	89%
245.41	BID:SAL.2	12/21/90	4.1 0	4.5 U	3.9 U	3.9 U	20%
245.12 14	RIC:SAL-1.3	12/21/90	1.6 U	1.8 U	1.5 U	1.5 U	65%
045.13.55	BIC-SAL-2.4	12/21/90	4.5 U	4.9 U	4.3 U	4.2 U	%99
245.16.18	B20-SAL-1.3	1/15/91	3.2 U	7.4 B	2.9 ∪	12.5 B	%68
245-10-10 245-17-40	B2D.SAL-2.4	12/21/90	2.8 U	3.0 U	2.6 U	2.6 U	16%
0.44.00.04	B13C-TVP-1.2	12/21/90	3.2 U	3.6 U	3.0 U	3.0 U	46%
045.00.03	R13B-TYP-1.2	2/28/91	14.7 B	6.8 B	4.18	5.5 B	85%
245.24.25	R130-TYP-1.2	2/28/91	18.3 B	4.3 B	2.3 8	3.3 8	82%
045.05	R13A.TYP	2/28/91	13.1 B	8.48	4.4 B	7.0 8	%68
245.07	B100-TYP	2/28/91	6.38	2.2 B	3.7 B	14.0 B	95%
045.03	R10A-TYP	2/28/91	11.4 B	4.7 8	. 2.5 8	9.5 B	85%
245.29	R10C-TYP	2/28/91	11.0 B	3.98	2.8 B	2.2 U	83%
245.30.31	R108-TYP-1.2	2/28/91	6.18	5.7 B	3.0 B	4.18	87%
245.32		12/21/90	3.3 U	3.6 U	3.1 U	3.1 U	51%
245.33	RIBSPA	12/21/90	3.3 U	3.7 U	3.1 U	3.1 U	26%
215.34.35.36 REP 1	R9B SCI-1.2.3 REP 1	1/15/91	3.2 U	6.5 B	2.9 U	2.9 U	95%
245.37	R9C-SCI	1/15/91	3.9 U	8.48	3.6	9.0	93%
245.38.39	R9D-SCI-1.2	1/15/91	5.1 U	14.7 B	6.7	4.6 U	84%
245.40.41.42 REP 1	R9A-SCI-1,2,3 REP 1	1/15/91	6.1	8.3 B	4.6	€.4	85%
	R7C-SAL-1	1/15/91	8.2	9.68	5.6	6.1	%68
245-44	R7.SAL.2	1/15/91	7.4 U	18.08	131.8	25.1	%68
245.45	R5C-SAL-1	1/15/91	2.9 ∪	6.0B	2.7 U	18.1	85%
245.46	R5C-SAL-2	1/15/91	0.9	16.5 B	12.9	6.3 U	%6 8
245.47	R4D-SAL-1	1/15/91	3.2 U	7.0 B	2.9 U	17.6	%6 8
245.48	R4D.SAL-2	1/15/91	7.4 U	18.18	11.8		92%
245.49	R7D-SAL-1	1/15/91	5.8 U	12.6 B	13.2	5.3 U	91%
245.50	R7D-SAL-2	1/15/91	0.9 0.9	13.3 B	16.6	5.4 U	%6 8
PROCEDURAL BLANK		12/21/90	5.8 U	6.4 U	6.4 U	5.3	38%
PROCEDIBAL BLANK	¥	1/15/91	4.2 U	7.9	3.8 U	3.8 U	85%
POCCEDIBAI BI ANK	ž	2/28/91	4.7	6.5	2.6	5.9	75%
R indicates analyte detected in blank.	Note.	lanks for specif	blanks for specific samples are identified by corresponding "extraction date".	ied by corresponding	g "extraction date	•:	

B indicates analyte detected in blank. Note, blanks for spec U indicates analyte not detected at detection limit shown

MATRIX SPIKE RECOVERIES

(Concentrations in ug/kg Dry Weight, ppm)

	Sponsor Code		TETRABUTYL TIN	TRIBUTYL	DIBUTYL	MONOBUTYL	SURROGATE RECOVERY
Sample Concentration: Amount Spiked: Amount Recovered: Percent Recovery:	R9B-SCI-1,2,3 REP 1	12/21/90	3.2 U 893.0 600.1 67%	6.5 893.0 701.1 78%	2.9 U 893.0 692.2 77%	2.9 U 893.0 194.1 22%	92%
Sample Concentration: Amount Spiked: Amount Recovered: Percent Recovery:	HIA-SPA	1/15/91	4.7 U 1087.0 824.5 75%	9.2 1087.0 885.4 81%	4.3 U 1087.0 852.3 78%	19.8 1087.0 178.6	89% 87%

PLANT PCB RESULTS (Concentrations in ug/Kg Dry Weight, ppb)

SURPOGATE	J 92 %					0 61 %	J 82 %	U 72 %	% 62 n	153 %	82 %	% 98 n	% 06 n	144 %	78 %	. 89 n	% 66 I	7 46 %	U 67 %	% 66 n	U 51 %	U 75 %	U 67 %	U 82 %	U 65 %	U 77 %	39 %	U 40 0	63 %	% % 0 0 0 0 0 0 0 0 0	* * * * * * * * * * * * * * * * * * *	85 %	83 %	8 8 8	% 56 N	_	U 82 %	
Aroclor- 1260	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	00	000	2 5	200	100	100	100	100	100	100	
	D	0	9	>	_	9	0	¬	>	Þ	0	>	-	>	=	>	Þ	-	>	>	-	>	כ	-	>	⊃	> :	> :	> :	0 =	=) =	=) =)))	
Aroclor- 1254	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	001	000		000	100	100	100	100	100	100	
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Aroclor- 1248	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	00.		100	100	100	100	100	100	100	
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Aroclor- 1242	100	100	100	100	100	100	100	100	100	100	100	100	100	9	9	100	100	100	100	100	100	100	100	100	100	100	100	100		2 5	100	100	100	100	100	100	100	400
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Aroclor- 1232	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		2 6	100	100	100	100	100	100	100	•
)	D	-	>	>	-	-	D	D	-	-	=)	5	> :	=	-	>	>	D	D	D	-	-	-	=	> :		=	=			5	D	-	-	D	=
Aroclar- 1221	100	100	100	100	100	100	100	100	100	100	100	100	100	9	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100	100	100
	ם	D	-	D	-	¬	D	>	-	-	=	>	>	> :	=	>	=	>	=	=	-	-	D	=	-	>	> :)) = 		0	5	D	D	¬	D	D 0	=
Aroclar- 1016	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	9	001		100	100	100	100	100	100	. 100	100	100
% Molst.	¥	90	9	91	80		9.5	≨	73	91	72	89		90	≨	98	8	81	00	88	85	81	92	80	86	ž		9	5	ž Ž	75	78	93	7.4	83	76	89	9
Date Anal'd	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/5/90	12/5/90	12/5/90	12/5/90	10/8/01	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	43/6/00
Date Ext'd	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	00/00/14	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	00/00/10
Sponsor Code	BLANK 1	RSB-SPA	R4B-SPA	R7A-SPA	R2A-SPA-1,2,3	R1A-SPA	R2B.SPA-1,2	R2B-SPA-1,2	RID-SAL-1	RID.SAL-2	HIC-SAL-1,3	HIC-SAL-2,4	R2D-SAL-1,3	R2D-SAL-2,4	BLANK 2	F13C-TYP-1,2	R138-TYP-1,2	R130-TYP-1,2	R13A-TYP	R100-TYP	R10A-TYP	R10C-TYP	R108-TYP-1,2	R78-SPA	R1B-SPA	RIB SPA	H9B-SCI-1,2,3	R9C-SCI		H9D.SCI.1 2	R9A-SCI-123	H7C-SAL-1	R7-SAL-2	R5C-SAL-2	H5C-SAL-1	R4D-SAL-1	R4D-SAL-2	0.70 CAI 4
Client Sample ID	BLANK 1 B	245-1 F	245-2 F	245-3 F	245.4,5,6 F	245.7 F		245-8,9 F	245-10 F			_		6				245-24,25					3	٠			35,36		BLANK 3		42				9			2 07 370

U indicates analyte not detected above detection limit shown. NA indicates not applicable

Page 1

PESTICIDE RESULTS (Concentrations in ug/Kg Dry Weight, ppb)

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Date	Anal'd	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	12/5/90	19/8/00
Date	Ext.q	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	11/29/90	06/62/11	06/62/11	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	11/30/90	00/06/++
Sponsor	Code	BLANK 1	R5B-SPA	H4B.SPA	R7A-SPA	R2A-SPA-1.2.3		R2B-SPA-1.2	R2B.SPA-1.2	RID-SAL-1	RID-SAL-2	RIC-SAL-1,3	RIC-SAL-2,4	R2D-SAL-1,3	R2D-SAL-2,4	ZX N	R13C-TYP-1,2	R138-TYP-1,2	H130-TYP-1,2	RI3A-IYP	H100-17P	HIDA-IYP	HIDG-TYP	R108-TYP-1,2	× 400	A 00	•	3CI-1,2,3	ξ	R9D-SCI-12	R90-SCI-1.2	R9A-SCI-1.2.3	R7C-SAL-1	AL.2	R5C.SAL.2	SAL-1	SAL-1	R40.SAL-2	CAL.1
		BLAI	R58	H4B	A7A	RZA	RIA	R28	R2B	AID.	AIO.	AIC.	E S	R2D	R2D	BLANK 2	H 13	33	H13	K13/	HIOLH	HIOA	H105	R10E	A70.07A	ATIC: UTA		_	BLANK 3	H9D.	R90.			R7-SAL-2	R5C.	R5C.SAL.	R4D.SAL.	R40.	R7D.SAL-1
Client	Sample ID	BLANK 1	245-1	245-2	245-3	245-4,5,6	245.7	245-8,9	245.8,9	245-10	245.11	245-12,14	245-13,15	245-16,18	245-17,19	BLANK 2	245-20,21	245-22,23	245-24,25	245.26	243.17	245-28	245.29	245-30.31	K40.32	245.33	245.24.25.26	245.37	BLANK 3	245-38,39	245-38,39	245.40,41,42	245-43	245-44	245.45	245.46	245.47	245-48	245.49

U indicates analyte not dotected above detection limit shown, NA indicates not applicable

PESTICIDE RESULTS (Concentrations in ug/Kg Dry Walght, ppb)

Client	Sponsor	Date	Date	1				Endo-		Endo-				1	
Sample ID	Code	Ext'd	Anal'd	4,4*.DDE	4.4DDT	ă	Dieldrin	sullan		Sulfan II		Sullate	0	Englin	=
BI ANK 1	BI ANK 1	11/28/90	12/3/90	20 U	20	_	20 U	20	-	20	_		0 O	•	20 U
245.1	R5B-SPA	11/28/90	0	20 U	20	-	20 U	20	-	20	-	•••	000	9	70
245.2	A4B.SPA	11/28/90	•	20 U	20	n	20 U	20	-	20	5	•••	ე ე		20 U
245.3	R7A-SPA	11/28/90	6	20 U	20	-	20 U	20	-	20	.	••	ည္း လူ		ລ :
245.4.5.6	R2A-SPA-1.2.3	11/28/90	12/3/90	20 U	20	-	20 U	20	-	20	5	••	္က		ດ : ວູ
245-7	R1A-SPA	11/28/90	6	20 U	20	-	20 U	20	⊃	20	-	•••	ာ စ		٦ 20
245.8.9	R2B-SPA-1.2	11/28/90	6	20 U	20	ם	20 U	20	>	20	-	••	ᅇ		20 20
245.89		11/28/90	12/4/90	20 U	20	>	20 U	20	-	20	5	••			⊃ : 02
245-10	RID-SAL-1	11/28/90	12/4/90	20 U	20	-	20 U	20	-	20	.		30 S		20 C
245-11	RID-SAL-2	11/28/90	12/4/90	20 U	20	>	20 C	20	- :	20	5 :		2 2		o : c
245-12.14	RIC-SAL-1,3	11/28/90	12/4/90	20 U	20	-	20 C	20	-	20	- :				20 C
245-13,15	RIC-SAL-2,4	11/28/90	12/4/90	20 U	20	-	20 □	20	5	20	:		က : လ		200
245-16.18	R2D-SAL-1,3	11/28/90	12/4/90	20 U	20	-	20 20	20	-	20	.		בס כס		20 C
245-17.19	R2D-SAL-2.4	11/28/90	12/4/90	20 U	20	-	20 N	20	-	20	> :				∩ :
BLANK 2	BLANK 2	11/29/90	12/4/90	20 U	20	5	50 20	20	-	20	-) 20		20 20
245-20.21	R13C-TYP-1,2	11/29/90	12/4/90	20 U	20	-	20 C	20	>	20	- :		ב בס	_	20 2
245.22.23	R138-TYP-1,2	11/29/90	12/4/90	20 U	20	ם	20 U	. 20	-	20	- :		27		50 C
245-24.25	R130-TYP-1,2	11/29/90	12/4/90	20 U	20	_	20 U	20	-	20	.		יי מ	_	50 50
245.26	R13A.TYP	11/29/90	12/4/90	20 U	20	5	70 C	20	- :	20	5 :		מ		20 C
245.17	R10D-TYP	11/29/90	12/4/90	20 U	. 50	-	20 20	20	> :	50)		מ		20 0
245.28	R10A-TYP	11/29/90	12/4/90	20 U	20	-	20 20	20	5	50	.		_		20 C
245.29	R10C-TYP	11/29/90	12/4/90	20 U	20	-	70 70	20	- :	20	> :		O :		20 C
245.30 31	R108-TYP-1,2	11/29/90	12/4/90	20 U	20	-	30 20	20	> :	20) :				20 C
245.32	R78-SPA	11/29/90	12/4/90	20 U	20	-	30 C	20	- :	20)				50 50 50 50 50 50 50 50 50 50 50 50 50 5
245.33	R1B.SPA	11/29/90	12/5/90	20 C	20	-	7 50	20	- :	20	- :				20 20 20
245.33	R1B.SPA	11/29/90	12/5/90	20 U	20	-	20 L	20	-	20)				20 20
245-34,35,36	R5B-SCI-1,2,3	11/29/90	12/5/90	20 U	20	D	30 20	50	- :	50)		_		20 C
245-37	R9C-SCI	11/29/90	12/5/90	0	20	-	20 C	20	= :	20	- :		_		202
BLANK 3	BLANK 3	11/30/90	12/5/90	20 C	20)	20	20	- :	20	:			5 :	50 C
245.38,39	R90-SCI-1,2	11/30/90	9		20	- :	20	20	> :	0 0	:		٠,		2 2
245.38,39	R9D-SCI-1,2	11/30/90	9	0	20	- :	202	20	- :	50	o :		٠,	o :	2 2 2
245-40,41,42	R9A-SCI-1,2,3	11/30/90	9	20 U	20	- :	20	20	- :	20	ɔ :		_ ·		ב ממ
245.43	R7C-SAL-1	11/30/90	12/5/90		20	-	20	20	-	20	5 :		_		20 C
245.44	R7.SAL-2	11/30/90	12/5/90		20				-	20	-		0	5	50 O
	R5C-SAL-2	11/30/90	12/5/90	20 C	20		20	20	-	20)		20	_	20 20
245.46	R5C-SAL-1	11/30/90	12/5/90		20	-	20	20	>	20	-		20	_	50 50
245.47	R4D.SAL-1	11/30/90	12/5/90		. 20	-	20	20	-	20	-		20	_	20 C
245.48	840.SAL-2	11/30/90	12/5/90	20 U	20	-	20	20	-	20	-		20	_	20 02
245.49	870.SAL-1	11/30/90	12/6/90	20 U	20	-	20	20	-	20	-		20	_	20 U
01.010	870.SAL.2	11/30/90	12/6/90	20 U	20	>	20	1 20	>	20	-		20	_	20 N
00.047) •													

U indicates analyte not detected above detection limit show NA indicates not applicable

PESTICIDE RESULTS (Concentrations in ug/Kg Dry Weight, ppb)

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SURPOGATE DBC		•	•							•	_			•	-				_			•		_		•-	•	•	_			_	•	~	٠	<u> </u>		· 60	7	- αο
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Heptachlor Epoxide	00	000	20	20	20	20	00	0	200	200	000	20	20	20	20	50	20	000	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20		20	20	20	20	20
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Heptachlor	20	20	20	20	20	20	20	000	000	200	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	50	50	20	0 0	0 0	0 0	20	20	20	20	20	50	20	20	50
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Endrin Aldehyde	20	20	20	20	20	20	20		20			20	20	20	20	20		20	20	20	20	20	20	20	20	20	20	0 6	2 6	0 6	9 6	0 0	D 6	0 2 0	20	20	50	20	20	20
Date Anal'd	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/3/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/4/90	12/5/90	12/5/90	12/5/90	12/5/80	00/2/07	12/5/90	00/2/64	12/5/30	06/6/90	12/5/90	06/0/21	12/5/90	12/5/90	12/5/90	12/6/90	12/6/90
Ext'd	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/28/90	11/29/90	11/29/90	11/29/90	11/29/90		11/29/90							06/62/11	11/20/90	00/00/++	11/30/90	00/00/++	06/06/11	06/06/4	11/30/90	06/06/11	11/30/90	11/30/90	11/30/90	11/30/90	11/30/30
Code	BLANK 1	R5B-SPA	R4B.SPA	R7A-SPA	R2A-SPA-1,2,3	R1A-SPA	R28.SPA-1,2	R2B.SPA-1,2	RID-SAL-1	RID-SAL-2	RIC-SAL-1,3	RIC-SAL-2,4	R2D-SAL-1,3	R2D.SAL-2,4	BLANK 2	R13C-TYP-1,2	R138-TYP-1,2	R13D-TYP-1,2	R13A-TYP	R100-TYP	R10A-TYP	H10C-TYP	H10B-17P-1,2	H/B·SFA	HIB SPA	•	DOC 001	BI ANK 3	DOD. CC1. + 3	R90.5CL.1.2	B94.5C1.124	B7C.SAL.	D7 CA1 2	D. 1971.9	7.7V0.00U	13C-3AL-1	H4U-SAL-1	H4D.SAL-2	H/U.SAL-1	H/D-SAL-2
Sample ID	BLANK 1	245-1	245-2	245-3	245-4,5,6	245-7	245-8,9	245-8,9	245-10	245.11	245-12,14	245-13,15	245-16,18	245-17,19	BLANK 2	245.20,21	245.22,23	245-24,25	245.26	245-17	245.28	245.29	245-30.31	245.32	245.33	245.34.36.36	944.37	BLANK	245.38 39	245-38.39	245.40 41 42	245.43	245.44	44.042	04.040	240.40	245.47	245-48	240.49	245-50

U indicates analyte not detected above detection limit show NA indicates not applicable

PESTICIDE MATRIX SPIKE RECOVERIES

٥	₹ ₹	\$ \$	2 2
4,4'-DDD			
Chlordane	A A	₹ ₹	\$ \$
	\$ \$	\$ \$	≨ ≨
Gamma- BHC			
	\$ \$	\$ \$	\$ \$
Delta- BHC			
	\$ \$	₹ ₹	\$ \$
Beta- BFC			
	\$ \$	₹ ₹	\$ \$
Alpha- BHC			
	* *	* *	* *
Aldrin	71	102	105
% Molst.	2 2	\$ \$	ž ž
Date Anal'd	12/3/90 12/3/90	12/5/90 12/5/90	12/5/90
Date Ext'd	11/28/90 12/3/90 11/28/90 12/3/90	11/29/90 12/5/90 11/29/90 12/5/90	11/30/90
Sponsor Code	R2A-SPA-1,2,3 R2A-SPA-1,2,3	R9B-SCI-1,2,3 R9B-SCI-1,2,3	R9A-SCI-1,2,3 R9A-SCI-1,2,3
Client Sample 1D	245-4,5,6 245-4,5,6	245-34,35,36 245-34,35,36	245-40,41,42

PESTICIDE MATRIX SPIKE RECOVERIES

	₹ ₹	₹ ₹	\$ \$
Endrin			
	₹ ₹	\$ \$	₹ ₹
Sulfate			
	₹ ₹	≨ ≨	\$ \$
Endo- sulfan II			
	₹ ₹	\$ \$	\$ \$
Endo- sulfan	**	* *	**
Ę	4 10	64	62 3
Dieldrin			
-	\$ \$	≨≨	\$ \$
4,4'-DDT			
	\$ \$	≨≨	≨ ≨
4,4°-DDE			
Date Anal'd	12/3/90 12/3/90	12/5/90 12/5/90	12/5/90
Date Ext'd	11/28/90 12/3/90 11/28/90 12/3/90	11/29/90 12/5/90 11/29/90 12/5/90	11/30/90 12/5/90 11/30/90 12/5/90
Sponsor	R2A-SPA-1,2,3 R2A-SPA-1,2,3	R9B-SCI-1,2,3 R9B-SCI-1,2,3	R9A-SCI-1,2,3 R9A-SCI-1,2,3
Client Sample 10	245-4,5,6 245-4,5,6	245-34,35,36 245-34,35,36	245-40,41,42

PESTICIDE MATRIX SPIKE RECOVERIES

Client Sample 1D	Sponsor Code	Date Ext'd	Date Anal'd	Endrin Aldohyde	Heptachlor	Heptachlor Epoxíde	Methoxy- chlor		Toxaphene	282	o
245-4,5,6 245-4,5,6	R2A-SPA-1,2,3 R2A-SPA-1,2,3	11/28/90	12/3/90		NA N		4 4	\$ \$	200 NA 200 NA		67 %
245-34,35,36 245-34,35,36	R9B-SCI-1,2,3 R9B-SCI-1,2,3	11/29/90	12/5/90 12/5/90		NA NA NA NA		8 8	\$ \$	200 NA 200 NA		4 0 2 %
245-40,41,42	R9A-SCI-1,2,3 R9A-SCI-1,2,3	11/30/90	12/5/90				**	§ §	2000		66 65 %

BUTYLTINS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

(Concentrations in ug/kg dry weight)

MSL Code	Sponsor Code	% Surrogate	% Internal		.		
277- 1-R	SED09-CB	75.47	123.0	1.9 U	3.5	60	60
7.	SED07.CM	98.55	131.6		2.0	9 6	2.1
277- 3.R	SED01-MR	74.94	133.6	1.3 U	2,3	1.4 U	1.3 U
	SED05-CM	73.13	137.3	1.2 U	3.1	1.7	1.2 U
	SED10-CB	75.68	134.1	1.5 U	3.6	1.6 U	4.7
	SED13-CF	67.43	142.8	0.9 U	1.8	0.9	N 6.0
277- 7-H	SED08-CM	75.64	122.7	2.0	2.3		1,3 U
	SED14-BR	73.00	140.4	1.3 U	3.5	6.	2.4
	SED11-CB	75.35	142.5	0.9 U	33.4	U 6.0	0.9 U
277- 10-R	SED04-CM	86.65	127.5	1.4 U	3.1	2.0	2.3
277-11	SED02-CM	148.81	142.4	0.5	2.6	3.6	17.0
- 12	SED03.CM	83.58	133.6	3.0	2.6	1.4 U	2,9
277. 13.R	SEDWR09-CM	83.68	135.9	0.8 U	1.3	0.8 U	0.7 U
-	08A-SAL	128.66	145.5	2.4	4.5	. 2.2	53.5
277-15	14C-SAL	100.94	155.1	2.4	4.8	2.2	35.1
-	08C-SAL	98.79	134.9	2.0	3.5	11.1	24.6
277-17	04C-SAL	119.99	140.7	3.2	0.9	19.0	64.3
•	03C-SAL	91.91	126.7	2.2	3.1	9.9	15.6
•		83.66	136.6	9.3	4.8	12.1	24.7
	110.501	80.40	144.4	2.2 N	4.1	2.1 U	4.4
277- 20-R	11A-SCI	76.59	118.9	4.1 U	5.6	5.6	3.7 U
- 21	11B-SCI	129.64	136.8	5.5	5.2	2.6	9.5
277. 22.R	038-SPA	96.66	111.0	3.6 ∪	8.3	3.7	5.1
	04A-SPA	152.9	64.4	2.7	5.2	2.5	Ä
	14A-SCI	178.00	44.0	1.2	2.2	1.1	A N
277- 25-R	14D-SAL	81.97	117.4	3.1 U	4.4	3.0 U	5.6
	02C-SAL	88.17	113.4	9.7	6.5	3.5 U	7.1
	05D-SAL	74.01	127.2	54.7	35.8	2.3	5.3
277-28	03D.SAL	74.05	126.2	3.3	4.8	4.4	7.1
_		67.67	133.7	2.2 U	3.9	2.1 U	10.2
N	OBD-SAL	61.68	122.9	2.3 U	4.0	2.8	2.1
277- 30	08B-SAL	63.86	136.4	3.10	5.3	3.1 U	2.9 U
C	0BB-SAL	90.86	115.6	3.6 U	5.6	3.6 U	6.4
8		75.31	123.8	3.8 U	5.3	3.7 U	8.7
277- 32	03A-SPA	62.55	121.0	2.1 U	2.9	2.1 U	1.9 U
277-33	05A.SPA	70.21	125.6	2.2 U	5.2	2.2 U	2.0 U
277.34	HOB.SNOT	00 20	7 077	11 0 1	c	1	

BUTYLTINS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

(Concentrations in ug/kg dry weight)

MSL Code	Sponsor Cade	Tripentyl % Surrogate	Pentylbutyl % Internal	Tetra	Tributyi	Dibutyl	Monobutyl
277- 34 DUP	H08-SN01	80.00	128.8	1.4 U	3.5	4.2	1.7
277-35	ROB-SN02	80.15	134.2	0.6 U	1.4	6.0	
277.36	R13-CBR1	71.18	132.5	14.6	40.7	30.1	11.8
277.37	R01-MOR1	69.60	122.2	3.9 U	34.9	9.3	
277- 38	RO1-MOR2	131.20	52.3	5.0 U	38.3	5.0 Ù	
U Indicates not	detected at detection limit shown	tion limit showr		-			
MATRIX SPIKE R	RESULTS			•			
277-1-C SPIKE		69.36	144.4	168.0	219.6	243.0	37.6
Percent	18covery			* 00	9	•	•/ /:-
277-5-C SPIKE	•	67.29	142.5	149.6	184.6	31.5	123.4
Percent Re	Зесоvery			34%	41%	ž	28%
277-8-C SPIKE		82.71	125.4	138.4	203.7	260.7	44.8
Percent Re	3ecovery .			35%	21%	% 99	11%
227-BLANK SPI	m Tu	76.42	177.2	294.4	301.6	327.5	221.5
Percent Rec	Зеса ve ry		•	28%	%69	* 9	43%
277-36 SPIKE		73.86	128.1	1004.6	1153.7	841.8	63.5
Percent Recavery	Recavery			%09	%69	20%	4%

METALS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

(concentrations in mg/kg dry weight)

MSL Code Rop	Sponsor ID	Rep	Ag	As	8	(a) Cr	రె	웊	N	(a) Pb	(q)	2
			¥	数	¥¥	AAXRF	XX	CVAA	¥.	AAXRF	AAXRF	×
SEDIMENT												
-	SED09-CB	REP 1	0.448	19.3	0.28	183.0	60	28.0	107 7	e d		•
277. 1 REP 2	SED09-CB	REP 2	0.446	20.7	0.28	168.0	72.4	0 394	106.8	0.00	÷ 6	142.2
277. 2	SED07.CM		0.355	10.6	0.33	195.0	67.5	0.469	20.0	3.4.0 0.4.0) () () ()	140.0
277. 3	SED01-MR		1.418	23.7	0.33	174.0	71.6	0.515	102.0	5. % 5. %	0 0	27.0
277. 4	SED05-CM		0.660	14.4	0.26	179.0	67.6	0.410	125.0	2.00.	2 0	27.75
277. 5	SED10-CB		0.359	17.2	55.0	126.0	67.0	0.4	6.00	- 6	0.25	4,861
277. 6	SED13-CF		0.234	1 SC 15	0.0 8.0 8.0 8.0	1100	0. TO	0.32	3 3 3 6	8.74	0.91	135.0
277. 7	SED08-CM		0.023	5.00	6.0	2240	7 C	0.00	32.2	0.4.0	0.14 U	161.7
277. 8	SED14.BR		0.00	0 4	95.0	0.404	9 0	4 00.0	72.2	20.9	0.14 U	88.5
	00.1000		0.500	9 6	0.00	0.581	5.77	0.362	122.1	32.5	0.25	164.7
. •	2011.000		0.350	15.3	0.22	181.0	50.3	0.283	83.3	13.7	0.16	89.8
01.//2	SEDUA-CM		0.143	13.4	0.31	214.0	72.6	0.439	135.5	35.7	0.17	160.1
11.//2	SEDUZ-CM		0.372	18.5	0.32	219.0	90.6	0.469	125.4	36.8	0.33	158.9
77.1	SED03 CM		0.479	18.2	0.41	179.0	70.1	0.166	145.2	33.0	0.42	166.1
277-13	SEDWR09-CM		0.194	0.0	0.22	256.0	28.6	0.164	72.7	13.2	0.17	77.8
PLANTS												
277.14 DEB1	140 480			•	•		1					
	760.000		0.003	5.5	0.13	0.4	0.7	0.024	1.7 U	0.23	1.10 U	27.3
er 1	14C.SAL			0.98 U	0.13	0.4	9.2	0.023	2.33	0.34	1.10 U	29.2
	14C-SAL		0.003	0.92 U	0.17	3.6	10.1	0.034	3.78	0.99	0.70 11	30.8
	14C-SAL		•	•	•	3.9	•		•	1 27 *	•)
277.16	OBC-SAL		0.007	0.85 U	0.21	9 .0	8.7	0.030	1.48	6 0	0.881	20.00
277.17	04C-SAL		0.007	1.0 U	0.29	5.9	19.1	0.038	629	1.42	200.0	1 0
277.18	03C-SAL		0.003 U	1.0	0.05	1.8	8.0	0.016	33.5	- C	0 87.0	40.7 9.8
277.19	11C-SCI		0.003 U	0.79 U	0.16	0.7	15.3	0.018	4.47	0 49	0.55.0	0 0
277.20	11A-SCI		0.003 U	0.87	0.17	2.7	31.1	0.050	6.70	0.87	0.30.0	000
277.21	118-SCI		0.003 U	0.89 U	0.24	4.0	17.4	0.044	626	1 03	0.49.0	425.0
277.22	03B.SPA		0.135	1.04	0.12	7.7	13.9	0.025	9.29	1.84	0.03	0.00
277.23	04A-SPA		0.107	1.82	0.07	2.5	8.9	0.014	2.05	0.60	0.68 U	609
277.24	14A-SCI		0.034		0.08	3.3	7.7	0.038	3.47	1.18	0.58 U	48.4
277.25	14D-SAL		600.0	0.95 U	0.07	1.7	11.4	0.019	1.85	0.71	0.71 U	29.8
277.26	O2C-SAL		0.003		0.16	1 .8	10.8	0.019	2.47	0.61	2.20 U	40.0
2	05D-SAL		0.014		90.0	4.1	11.5	0.018	4.49	0.86	0.66 U	4 6
N ·	03D-SAL		0.00	0.86 U	0.08	5.6	12.0	0.021	5.27	0.93		25. B
cv .	080-SAL		0.003		0.15	7 .0	8.9	0.025	0.93 U	0.38		9 6
	08B-SAL		0.003		0.10	5.0	8.8	0.018		0.49	0.77 U	57.4
77.3	11D.SCI		0.005	0.84 U	0.13	1.9	13.6	0.028	5.81	0.76	0.611	. 64
77	03A-SPA		0.217	1.27	90.0	7.2	13.7	0.022	8.76	1.39	0.6311	0.80
277.33	05A.SPA		0.165	0.99	0.08	8.5	11.4	0.027	9.1	2.04	0.6511	2 2
						•				i)	;

METALS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

(concentrations in mg/kg dry weight)

MSL Code Rep						(a				(a)	(2)	
	Ren Sponsor ID Rep	Rep	Y	¥.	8	Ö	8	Ŧ	Z	P P	S.	ล
			· *	AF.	AA	AWXRE	APF.	CVAA	XPF	AAXRF	AAXRF	失
11951169												
277.34	ROB-SNO1		0.347	11.62	1.03	25.5	93,6	0.180	10.2	1.15	1.33	401.0
277.34	BOB-SNOT		0.360	9.22	1.03	2.1	74.3	0.172	8.5	1.43	1.04	309.0
277.35	BOR.SNO2		0.121	25	0.34	- 5	23.5	0.055	4.5	0.82	1.47	131.4
277.36	R13-C8R1		1.03	10.79	3.34	4	164.1	0.469	5.78	1.89	3.98	273.0
277.27	BO1-MOR		0.819	9.76	3.53	4.0	23.1	0.398	7.74	1.71	4.19	71.7
277.38	BO1.MOR2		0.914	8.93	3.45	6.6	20.5	0.304	5.33	1.39	3.52	71.1
טניייים			6100	N/A	0.01 U	8.0	Y'N	0.001 U	٧/٧	Y/X	0.14 U	N/A
Blank			0.007	N/A	0.01 U	9.0	N/N	0.001 U	٧\ ٧	0.17 U	0.14 U	۷ ۷

U indicates not detected at detection limit shown N/A indicates not applicable

PESTICIDES IN SED., PLANT & TISSUE 1 TISSUE

Sponsor: SIMMER (McGUFFIE)

CONCENTRATIONS IN UG/KG WET WEIGHT

Diefdrin 4.4-DDDT 4,4-DDDE 4,4 Chlordane Сатта-ELC. Delta-Bota-出 Alpha-BEC Aldrin Moist. THE Moist. % NN/A 660 660 772 772 334 334 554 554 SED03-CB SED07-CM SED01-MR SED05-CM SED10-CB SED13-CF SED08 CM SED14-BR SEDW/R09.CM SED11-CB SED04.CM SED02-CM 084.SAL 14C.SAL 08C.SAL 04C.SAL 03C.SAL 11A.SCI 11A.SCI 14A.SCI 14A.SCI 14A.SCI 14A.SCI 03C.SAL 02C.SAL 03D.SAL 05D.SAL 03D.SAL 03D.SA SEDIMENT METHOD BLANK PLANT METINDO BLANK 5 1 2 5 16 277. 277. 277. 277. 277. 277. 277. 277. 277. 277. 277-PLANTS

2.0 U 2.0 U 2.0 U 2.0 U

277.

PESTICIDES IN SED., PLANT & TISSUE Spanson: SIMMER (McGUFFIE)

(CONCENTRATIONS IN UGIKG WET WEIGHT)						-								RECOVERY
	Moist.	sulfan I	tullan 1	Sulfate	Endrin	Endrin Aldehyde		Hepta- chlor	I	Heptachlor Epoxide	Methoxy- chlor	Toxa- phene		SURROGATE DBC
SEDIMENT														
SEDIMENT METHOD BLANK	N/A	3.0 U	3.0 U	3.0 U	3.0		0	3.0	=		- C	200	=	7
-	09 BO	3.0 U	3.0 U	3.0 U		. n	3.0	30	, =	200	000		=	2 2
8	CM 55	3.0 €	0	3.0		 	0	3.0	=					2
277. 3	AR 47	3.0 U	3.0 U	3.0	3.0	ر د	3.0		, ,	3.0 0			=	
~	CM 45	3.0 U	3.0 U	3.0			_		=					
S.	CB 72	5.0 U	5.0 U	5.0 U		2	5.0 U		· =	-				n c
9	CF 33	3.0 U	3.0 U	3.0					_					, e
	38 38	3.0 U	3.0 U	3.0			_		=	30.0			2	9 4
6 0	3R 34	3.0 U	3.0 U	3.0					=					9 0
277- 9 SED11-CB	CB 32	3.0 ∪	3.0 U	3.0			_		=					0 0
277- 10 SED04.CM	:M 54	3.0 U	3.0 U	3.0			_		=					n •
277. 11 SED02.CM	.M. 49	3.0 U		3.0	8				=					
12	75 MX	3.0 €	3.0 U		Ö	. E	9		, =	0 0				9 0
277. 13 SEDWR09.CM	-CM 19	3.0 ∪		3.0 U	n		3.0		=	0.00	0.0) = 0 C	0 0
											•			
PLANTS														
PLANT METHOD BLANK	N/A	2.0 U	2.0 U	2.0 U	2.0	6	=	0 6	=	-	•	•		ć
277- 14 08A-SAL	68	2.0 U	2.0 U			. =	2 0	0 0	, -		2 6			9 1
277- 15 14C SAL	60	2.0 U	2.0 U	-					=	2.0	9 6		> =	7 .
277- 16 08C-SAL	98		_	_							o c	- •		320
277- 17 04C-SAL	06	2.0 U	2.0 U	2.0	20.0	2	202	000	, -	0.00	_	- •		D (2)
277- 18 03C-SAL	84	2.0 U	2.0 U	2.0 U	2.0	D		_	. =				> =	7 -
6.	06		0	20 U	2.0		0	_						- 2
50	87		0	2.0	5.0		_		_		-	_		106
2	86	2.0 C	0	2 0	5.0		0	_	_	2.0 U	2.0 U			113
- 55	97		0	0	5.0			_	_	_	_	_		121
. 23	97		0	0	2.0	0 0	2.0 U		_	2.0 U	2.0 U		D	. 4
2	74			0	20		_	_	_	2.0 U	2.0 U	-		32
. 22	8			0	0		⊃ 0	2.0	_	2.0 U	_	_		103
56	84	2.0 U	0	0	5.0		0	_	_	2.0 U	2.0 U	_	_	87
. 27	87	2.0 U	2.0 U	0	0 0			_	_	2.0 U		-	_	122
28	85		2.0 U	_	0 0		0		_	2.0 U	2.0 U	-		176
53	87	2.0 U	2.0 U	0	50	J 2) 0		_	2.0 U	2.0 U	-		200
	98	2.0 U	2.0 U	0	2 0		0	2.0	_	2.0 €	_	_		2 4
277- 31 11D-SCI	88	2.0 U	2.0 U	2 0 U	201	7 2	0	0	_	2.0 U	200	200	_	
277- 32 03A-SPA	98	2.0 U	0	2 0 U	_	5	O	0	-	2.0	200	000		
277- 33 05A-SPA	84	2.0 U	2.0 U	2 0 U	201	2.	0	2.0	_	2.0 U	2.0 0.2	100))	75

PESTICIDES IN SED., PLANT & TISSUE & TISSUE Sponsor: SIMMER (McGUFFIE)

	*		%		Alpha-	Beta-	Delta-	Gamma-	Chlor-	4,4-	4.4-	4.4	
	Mols	:t:	loist. /	Aldrin	B+C	BFC	BHC CH	BEC	dane	000	DOOE	Doot	Dieldrin
TISSUE													
TISSUE METHOD BLANK	V/N	_	4/	10 U	100	100	10 U	100	10 U	100	10 0	10 U	·
277- 34 R08-9	SN01 66		99	10 0	10 U	10 U	10 U	100	10 U	100	10 0	10 U	10 U
277- 34 R08-			99	10 U	10 0	100	10 U	100	100	100	10 U	17 U	
277- 35 ROB-			35	10 U	10 0	10 U	10 U	100	10 U	10 U	10 U	10 U	
277- 36 R13			92	10 U	10 U	120	24 U	100	10 U	100	115 U	30 U	
277- 37 R01-N	R01-MOR1 85		95	10 0	10 U	10 U	10 U	10 U	10 U	100	10 U	10 0	
277- 38 RO1-k	AOR2 88		99	100	10 U	100	10 U	100	10 U	100	100	10 U	

U indicates not detected at detection limits shown

PESTICIDES IN SED., PLANT & TISSUE Sponsor: SIMIMER (McGUFFIE)

ENTRATIONS IN UG/KG WET WEIGH	нт										PERCBNT RECOVERY
	*	Endo-	Eudo-	Endosullan		Endrin	Hepta-	Heptachlor	Methoxy-	loxa.	SURROGATE
	Moist.	suffan I	tollan 1	Sulfate	Endrin	Aldehyde	chlor	Epoxide	chlor	phene	280

	/9	111	157	110	119	130	70
						200 U	
						10 U	
						10 U	
						10 U	
						10 O	
						10 U	
						10 U	
3	0	10 C	10 U	10 U	10 0	10 U	10 0
	100	10 U	100	100	100	100	10 U
	٧/٧	99	99	35	92	82	88
	*	R08-SN01	R08-SN01	ROB-SN02	R13-CBR1	R01-MOR1	R01-MOR2
:	2	34	34	35	36	37	38
TISSUE	TISSUE ME I HOD	277-	277.	277-	277-	277-	277- 38 R01-N

U indicates not detected at detection fimits sho

PCBs IN SED., PLANT & TISSUE Sponsor: SIMMER (McGUFFIE)

(CONCENTRATI	OHS I	(CONCENTRATIONS IN UG/KG WET WEIGHT)	GHT										ע ענ	PERCENT RECOVERY
			Moist.	1016	۲	Arocior- 1221	Aroclor- 1232	Aroclor- 1242	Aroclor- 1248		Aroclor- 1254	Aroclor- 1260	S	SURROGATE
SEDIMENT														
SEDIMENT METHOD BLANK	HOO B	LANK	٧/٧	30	ם	30 U	30 11	_	•	=			:	;
277.	-	SED09-CB	09		· _	300	200		3 6	-	0.00	90	> :	37
. 277-	N	SED07-CM	53	0	=		000		36	:		30	- :	57
277-	ຕ	SED01-MR	47	30	, =	900		000	000	> :	30	30	> :	63
277-	4	SED05-CM	4		=				000	> :		0	-	73
277-	ĸ	SED10-CB	72		. =		2 4	- 0	30	> :		0	-	O
277-	9	SED13-CF	. 6		- -		0 6	٠,	20	- :		0	-	32
277-	7	SED08.CM	. e		s =		9 6	٠,	30	> :		0	5	38
277-	6 0	SED14.BR	9 6		. .		0 0	٠,	30	> :) 00 00	0	-	59
277-	σ	SEDITICA					9 6		30	.		0	-	87
277.	Ç	SEDO4.CM	4 4 4 4			٠.	30	_	30	-	30	0	Þ	97
277.		ED0101	r e			٠.	30		30	>	120	_	-	121
277	- 0	SEDOS-CIM	P 1		5 :	_	30	30 C	30	-	83		_	83
277	4 0	STOOP CM	/6	_ `	_		30		30	-	210	_	_	7 60
. / / 7	2	SEDWHOS-CM	6	_	_		C	30 U	_	_	75	30		0
PLANTS			r											
PLANT METHOD BLANK	BLAN	×	N/A	1 06	_	1 00				•	;			
277.	4.	ORA SAL	•	_			5		20	_	20 C	0	-	63
277.	. 40	14C.SAI		2 6		0 0 0		0	20	-	20 U	0	_	7.1
277.	4	OBC. SAI	h 4		_	5 0	٥.		20	_	_	0	_	132
277.	7 2	O4C.SAI	9 6	202					20	_	0	_	_	0
277.	- -	O4C:SAL	0 7	0 0 0		20 O	20 U	20 U	20	-	20 U	20	>	122
277.	0 0	10.00	* 6				_		20	_	_	_	_	=
277.	0 0	11A.SCI	7 6						20	_	_	_	_	67
		118.SCI	- 4				_		20	_	_	_	_	106
	22	03B-SPA	20	_		2 0 0	_	20 U	50	_	_	_	_	113
	16	D4A.SPA	. 6						20	_	_	_	_	121
	2 4	14A.SCI	7.4				_		20	_	_	_	_	48
	. v	140.541							20	_	_	_	_	32
	2 6	O2C.SAL	- 4				0 0 0	20 U		_	_	_	_	103
	9 6	70.070	P P				_		20	_	_	_	_	87
	, e	USU-SAL	87				_	20 U	20	_	_	_		100
		U3D-SAL	C .			0	_	0	20	_	_	_		476
	_	OBD-SAL	87	20 U		20 U	_	0		_	, ,			9/1
		08B-SAL	96				_	0	200					336
	31	11D-SCI	88			_	_		0 0		٠.			154
277- 3	32	O3A-SPA	86	20 U		20 U	20 U						_	49
277. 3	33	05A-SPA	78	_		20 ==	20 11		2 6			20 U	_	
	1			•		,) } 4		אַס		0		_	7.5

PCBs IN SED., PLANT & TISSUE Sponsor: SIMMER (McGUFFIE)

CONCENTRATIONS IN UG/KG WET WEIG	знт								RECOVERY
	*	Aroclor-	Aroclor-	Aroclor-	Aroclor-	Aroctor-	Aroclor-	Aroclor-	SURROGATE
	Moist.	1016	1221	1232	1242	1248	1254	1260	DBC

	67	111	157	110	119	130	70
				100 U			
				100 U			
				100 U			
				100 U			
				100 U			
;	100			100 U			
				100 U			
;	×××	99	99	35	92	82	88
		R08-SN01	R08-SN01	RO8-SN02	R13-CBR1	R01-MOR1	R01-MOR2
	Š	34	34	35	36	37	38
TISSUE	TISSUE METHOD	277.	277-	277-	277-	277- 37 R01-MOR1	277-

U indicates not detected at detection limits sho

PCB and Pesticide Matrix Spike Recoveries

	Sponsor Codes	Aldrin	Dieldrin	Aroclor- 1254	Surrogate DBC
24 14	SED03-CM SED03-CM	61% 62%	113% 88%	79%	2
33	05A-SPA 05A-SPA	57% 58%	59% 50%	189%	165%
9 9	R13-CBR1 R13-CBR1	107%	80% 83%	83%	116%

PCBs IN SED., PLANT & TISSUE Sponsor: SIMMER (McGUFFIE)

OHS IN UG/KG WET WEIGHT	i i	·							PERCENT RECOVERY
	•	Arocior-	Aroctor-	Arocior-	Aroclor-	Arocior-	Aroclor-	Aroclor-	SURROGATE
	Moist.	1016	1221	1232	1242	1248	1254	1260	DBC

	67	111	157	110	-	130	70
							100 U
						100 U	100 U
	100 U	100 U	100 U	_		100 U	
						100 U	
						100 U	
						100 U	
	100 C	100	100 U			100 U	
:	Y	99	99	35	92	82	98
	Y	R08-SN01	R08-SN01	RO8-SN02	R13-CBR1	R01-MOR1	R01-MOR2
		34	34	35	36	37	38
TISSUE	TISSUE METHOL	277.	277-	277-	277-	277- 37 R01-MO	277-

U indicates not detected at detection limits sho

PAHS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

במונדווע	CONCENTRATIONS IN OCING WEI WEIGHT	WEIGHT								
			Dibenzo-			Indeno-				
Code	Sponsor Code	% Molst.	(a,h)- anthracene	Fluor- anthene	Fluorene	1,2,3- Pyrene	2-Methyl- Naphthene	Naph- thalene	Phenan- threne	Pyrene
SEDIMENT			•							
277. 1	SED09-CB	%09	14	74	10 U	.	30	63	00	ā
277. 2	SED07.CM	55%	15	120	10 0	87	12	26	1 4 5 10	
277. 3	SED01-MR	47%	19	190	10 0	66	30			240
277- 4	SED05.CM	45%	10 U	10 U	10 U	10 U	_	40		10 0
277- 5	SED10-CB	72%	30	260	10 U	100	48	16	9	0
277. 6	SED13.CF	33%	U 01 .	49	10 U	14	17	35		4.6
277. 7	SEDOB.CM	38%	10 U	18		Ξ	100	9 40		0 0
277- 8	SED14-BR	34%	10 U	28		17	0	50	· C	. c
277. 9	SED11-CB	32%	10 U	100	10 U	10 U		20 U	10 01	101
277- 10	SED04.CM	54%	=	110	10 0	77		200	0	0
•	SED02-CM	49%	10	46		59	27	53	. E	120
277- 12	SED03-CM	21%	100	54	10 U			64	25	72
277. 13	SEDWR09.CM	19%	69	490	72	320	20	37	460	630
TLANTS		••								
277- 14	OBA-SAL .	%68	101	10 U	10 U	10 U	30	06	16	10 U
-	14C-SAL	80%		100	100	10 U	32	9.7	17	10 0
277. 16	08C-SAL	86%	100	⊃ <u>0 </u>	10 U	10 U	25	68	20	10 U
277. 17	04C-SAL	% 06	10 U	10 U	10 U	10 U	25	73	-	
277. 18	03C-SAL	84%			10 U	100	20 U	0	10 0	
277. 19	11C-SCI	%06		10 U	10 U	10 U	20 U	50 U	0	
277. 20	11A-SCI	87%	10 U	10 U	10 U	10 U	24	60	18	10 0
277- 21	11B.SCI	%98 **					27	76	18	
277. 22	038.SPA	87%					29	88	14	
277- 23	04A.SPA	87%					0	50 U	10 U	
	14A SCI	74%	100	10 C	10 0	10 U	20 U	50 U		
277. 25	14D-SAL	81%	0		10 0		24	61	16	
	02C-SAL	84%					24	59	22	
	050-SAL	97%				10 U	37	120	17	
77. 28	03D-SAL	85%	10 C			10 U	28	83	15	10 0
277- 29	08D-SAL	87%		10 0			28	83	15	
	08B.SAL	8 9 8						60	12	
	11D.SCI	88%					25	62	-	
.	03A-SPA	8 6%	100	10 U		10 U	24		4	
277- 33	05A.SPA	84%	10 U	100	10 U	10 U	25	68	17	10 0

PAHS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

1		WEIGHT									
:						Bonzo[a]	Benzo(b)	Benzo(k)		Benzo.	
Battelle	Sponsor		Acenaph-	Acenaph-	Anthra-	Anthra-	Fluor-	Fluor-	Benzolal	(a.h.i)-	
600	Code	% Molst.	thene	thylene	cene	cene	anthene	anthene	pyrene	perylene	Chrysene
SEDIMENT											
277- 1	SED09-CB	%09	100	101	17	«	e.	47	C	ų,	ŗ
277. 2	SED07.CM	22%			16	67	0 00	72	N 60	600	9 *
277- 3	SED01-MR	47%	12	15	38	100	96	8 8 9	130		- 0
	SED05-CM	45%	100	10 U	10 U	100	10 U	100	100	-	=======================================
277- 5	SED10-CB	72%	19	120	9.7	150	211	150	130	0	300
277- 6	SED13-CF	33%	100	10 U	10 U	53	18	20	22		200
277. 7	SED08-CM	38%	100	10 U	10 U	10 U	15	+	-	- -	. 4
277. 8	SED14.BR	34%	100	10 U	10 U	Ξ	18	13			. .
277- 9	SED11-CB	32%	100	10 U	10 U	10 0	100	100	101	101	2 5
277- 10	SED04.CM	54%	100	100	15	47	67	200	0 0) - '
277- 11	SED02-CM	49%	100	100	15	41	28	4 4	63	0 00	, r
-	SED03.CM	21%	100	10 U	10 U	22	40	26	500) tr	
277- 13	SEDWR09-CM	19%	27	98	230	290	250	250	410	350	270
PLANTS											
277- 14	OBA-SAL	89%	10 U	10 U	10 U	101	101	101	-		-
277- 15	14C-SAL	89%	100	100			100			0 0	
277- 16	08C-SAL	%98	100		100			200			
277- 17	04C-SAL	% 06	10 U	100	100						
277. 18	03C-SAL	84%	10 U	100							
277- 19	11C-SCI	%06	100	100			-				
277- 20	11A-SCI	87%	100	10 U	100	100					
277. 21	11B-SCI	86%				10 0	100	100		100	
277- 22	03B·SPA	87%			10 U	10 U	100	100			
	04A.SPA	87%	100		100		100	10 U	10 U	10 0	
77-	14A-SCI	74%			100	100			100		
	14D-SAL	81%	100					10 U	10 0	100	
	02C-SAL	84%				10 U	100		10 U	100	10 0
	05D-SAL	87%		100				10 U	100	10 U	
277- 28	03D-SAL	82%					100	10 U	100	100	
	08D-SAL	87%					100	100			
277- 30	08B-SAL	%98						100	100	10 0	
277. 31	110.SCI	88%						100			
277. 32	03A-SPA	%98					10 U	10 U			
277- 33	05A.SPA	84%	100	10 0	100	10 U	10 U	. 10 U	100		-

PAHS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

CONCENTRAL	CONCENTRATIONS IN DUING WEL WEIGHT)	(145)										
						Benzolal	Benzo[b]	Benzo[k]		Benzo-		
Battelle	Sponsor		Acenaph-	Acenaph-	Anthra-	Anthra-	Fluor-	Fluor-	Benzo[a]	(g,h,i)-		
Code	Code	% Moist.	thene	thylene	cene	cene	anthene	anthene	pyrene	perylene	Chrysene	
Tissue												
277. 34		%99	10 U	10 U	•	10 U	100	10 U	100	100		
277-34 DUP	H08-SN01	%99	100	10 U	100	10 U	10 U	100	10 U	10 U	100	
277- 35		35%	100	10 U	•	10 U	100	10 U	100	10 U		
277. 36		95%	100	10 U	•	100	100	10 U	100	10 U	•	
277. 37		85%	10 U	10 U	•	10 0	100	10 U	10 U	10 U		
277. 38		88%	100	10 U		10 U	10 U	10 U	100	10 U	•	
BLANK		N/A	10 U	10 U	•	10 0	100	10 U	100	10 U	•	
BLANK		N/A	10 U	10 U	•	10 U	100	10 U	10 U	10 U	•	

U indicates not detected at detection limit shown

PAHS IN SEDIMENTS, PLANTS & TISSUE Sponsor: SIMMER (McGUFFIE)

			Dibenzo.			Indone				
Battelle Code	Sponsor Code	% Moist.	(a,h)- anthracene	Fluor- anthene	Fluorene	1,2,3- Pyrene	2-Methyl- Naphthene	Naph- thalene	Phenan-	Pv representation
丁いい										
277- 34	R08-SN01	%99	10 U	10 U	•	10 U		60 U	10 U	10 0
277-34 DUP	R08-SN01	%99	10 U	100		10 U		09 n	10 U	0
277- 35	RO8.SN02	35%	10 U	=	10 U	10 U	30 U	09	10 U	10 0
277. 36	R13-CBR1	95%	10 U	10 U		10 U		220	10 U	10 0
277- 37	Ro1-MOR1	85%	10 U	100	•-	10 U		120	37	26
277- 38	R01-MOR2	88%	10 U	10 U		10 U		61	4	10 0
BLANK	BLANK	N/A	10 U	10 U		10 U		50 U	10 U	10 0
BLANK	BLANK	K/X	10 U	100	•	10 U		09 O	10 U	10 0

U indicates not detected at detection limit shown

Form Approved REPORT DOCUMENTATION PAGE OMB No. 0704-0188 Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS. 2. REPORT TYPE 1. REPORT DATE (DD-MM-YYYY) Final Report November 2000 5a. CONTRACT NUMBER 4. TITLE AND SUBTITLE Field Survey of Contaminant Concentrations in Existing Wetlands in the San Francisco Bay Area 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER 5d. PROJECT NUMBER 6. AUTHOR(S) C. R. Lee, D. L. Brandon, J. W. Simmers, H. E. Tatem, R. A. Price, and S. P. Miner 5e. TASK NUMBER 5f. WORK UNIT NUMBER 8. PERFORMING ORGANIZATION 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) REPORT NUMBER U.S. Army Engineer Research and Development Center ERDC/EL SR-00-15 Environmental Laboratory 3909 Halls Ferry Road Vicksburg, MS 39180-6199 10. SPONSOR/MONITOR'S ACRONYM(S) 9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Engineer District, San Francisco 333 Market St. 11. SPONSOR/MONITOR'S REPORT San Francisco, CA 94105-2197 NUMBER(S) 12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited. 13. SUPPLEMENTARY NOTES 14. ABSTRACT The importance of wetlands to the productivity of estuaries has been realized in the San Francisco Bay Area. A heightened public interest has emerged to restore wetland acreage that has dwindled away over the past 50 years. Dredged material was thought to be of potential value in wetland creation or restoration. This report presents the results of a field survey of existing wetland sites in the San Francisco Bay Area. Dominant plants, of existing wetland sites in the San Francisco Bay Area. Dominant plants, animals (where present) and wetland soil from selected marine and estuarine wetlands were sampled and analyzed for contaminants. These data will be used to establish a wetland reference database. Sediment biological and chemical test results concentrations will be compared to the reference database to evaluate its potential use in wetland creation. 15. SUBJECT TERMS Wetlands **PCBs** Heavy models Animal tissue concentrations

Plant tissue concentrations

17. LIMITATION

OF ABSTRACT

18. NUMBER

118

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PAHs

c. THIS PAGE

UNCLASSIFIED

Field survey

a. REPORT

UNCLASSIFIED

16. SECURITY CLASSIFICATION OF:

b. ABSTRACT

19a. NAME OF RESPONSIBLE PERSON

19b. TELEPHONE NUMBER (include area